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WP5 Case Study Report

Floods in Northern England

Deliverable 5.6

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Short Description: This report comprises the results of emBRACE floods in the north of England case-study. Taking a Sustainable Livelihoods Approach (SLA) this investigation has determined the range of resources and capacities that have been operationalised to develop resilience to flooding by a series of communities situated along a short river catchment in Cumbria, England. A series of context-sensitive resilience indicators are proposed.

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About emBRACE

The primary aim of the emBRACE project is to build resilience to disasters amongst communities in Europe. To achieve this, it is vital to merge research knowledge, networking and practices as a prerequisite for more coherent scientific approaches. This we will do in the most collaborative way possible.

Specific Objectives

- ⇨ Identify the key dimensions of resilience across a range of disciplines and domains
- ⇨ Develop indicators and indicator systems to measure resilience concerning natural disaster events
- ⇨ Model societal resilience through simulation experiments
- ⇨ Provide a general conceptual framework of resilience, tested and grounded in cross-cultural contexts
- ⇨ Build networks and share knowledge across a range of stakeholders
- ⇨ Tailor communication products and project outputs and outcomes effectively to multiple collaborators, stakeholders and user groups

The emBRACE Methodology

The emBRACE project is methodologically rich and draws on partner expertise across the research methods spectrum. It will apply these methods across scales from the very local to the European.

emBRACE is structured around 9 Work Packages. WP1 will be a systematic evaluation of literature on resilience in the context of natural hazards and disasters. WP2 will develop a conceptual framework. WP3 comprises a disaster data review and needs assessment. WP4 will model societal resilience. WP5 will contextualise resilience using a series of Case studies (floods, heat waves, earthquakes and alpine hazards) across Europe (Czech Republic, Germany, Italy, Poland, Switzerland, Turkey and UK). WP6 will refine the framework: bridging theory, methods and practice. WP7 will exchange knowledge amongst a range of stakeholders. WP8 Policy and practice communication outputs to improve resilience-building in European societies.

Partners

- ⇨ Université catholique de Louvain (UCL) - **Belgium**
- ⇨ University of Northumbria at Newcastle (UoN) - **UK**
- ⇨ King's College London (KCL) - **UK**
- ⇨ United Nations University Institute for Environment and Human Security (UNU), **Bonn**
- ⇨ Accademia Europea per la Ricerca Applicata ed il Per-fezionamento Professionale Bolzano (EURAC) - **Italy**
- ⇨ Helmholtz-Zentrum Fuer Umweltforschung GMBH - UFZ (UFZ) - **Germany**
- ⇨ University of York (SEI-Y) - **UK**
- ⇨ Stockholm Environment Institute - Oxford Office Limited (SEI-O) - **UK**
- ⇨ Swiss Federal Institute for Forest, Snow and Landscape Research - WSL (WSL) - **Switzerland**
- ⇨ Middle East Technical University - Ankara (METU) – **Turkey**
- ⇨ University of Reading (UoR) - **UK**

1. Contents

Acronyms

ACT – ACTion for Communities in Cumbria

CCF – Cumbria Community Foundation

CCoT – Cockermouth Chamber of Trade

CCVS – Cumbria Council for Volunteers

CEP – Community Emergency Plan

CFAG – Cockermouth Flood Action Group

CoP – Community of Practice

CoRP – Community of Resilience Practice

DCLG - Department for Communities and Local Government

Defra - Department for Food and Rural Affairs

EA – Environment Agency

FRM – Flood Risk Management

FWMA - Flood and Water Management Act

HLS – Higher Level Stewardship (Agricultural)

IEM – Integrated Emergency Management

KFAG – Keswick Flood Action Group

KFRG – Keswick Flood Recovery Group

LA – Local Authority

LGD - Lead Government Department

LLFA - Lead Local Flood Authority

NFAG – Northern Flood Action Group

PLP – Property-Level Protection

SNM – Social Network Mapping

2. Executive summary

As one of 5 case studies into community resilience undertaken as part of the emBRACE project across Europe, this study was carried out with the participation and assistance of members of a complex amalgamation of geographical, interest and practice communities situated along the catchment of the River Derwent in the county of Cumbria, north England.

In terms of meeting the principal emBRACE aim of 'Building resilience to disasters amongst communities in Europe', this case study offered particular value, because it presented an opportunity to investigate the concept as it is operationalised across a range of hydrologically-linked topographical and social contexts i.e. from hill farms in the Lake District fells to the post-industrial port town of Workington that lies at the mouth of the river. The focus of the research was on understanding community resilience to hi-magnitude floods, because parts of this catchment have experienced at least two such events since 2005.

Including data from >65 interviews a series of workshops and observations at community events the study met a series of aims related to understanding and developing indicators for community resilience at two important scales (sub-county and catchment).

In respect to the first aim, the research confirmed a complex mix of resource and capacity sets that comprise the core of community disaster resilience and identified that, while civil protection dimensions remain key facilitators, they cannot effect fully resilient outcomes unless developed in concert with the broader social protection objectives and alongside a cohort of engaged community members.

The complexity of the relationships between the emBRACE-relevant domains of resources/capacities, actions and learning was evident, as the lens passed down the catchment from the Fells to the sea and perfectly illustrated the difficulty in compartmentalising 'Community Resilience' as any simple, uniform component of a population's makeup: the even greater complexity of the cross-context indicator sets proposed is a demonstration of this. Some key attributes did emerge, however. For example, the social network maps can be used to illustrate very effectively the complex lateral bonding and bridging nature of key individuals' social networks at community level, but they also reveal how effective some of these people are at linking hierarchically (often on first-name terms) into power relationships. The potential role of people like this in facilitating concerted community engagement with risk mitigation and resilience building should not be underestimated or devalued. However, the evidence also shows that this engagement can come at considerable personal cost to these people, especially if they have been directly hazard affected themselves. Furthermore, if so much of a community's resilience is based on one or a small number of individuals does this not also point to a vulnerability, or at least

a lack of redundancy, at its heart that the presence of strong, accountable, institutional services and support ('social protection' broadly understood) should go some way to alleviate?

In relation to the second aim, to build trust in FRM bureaucratic processes and civil protection procedures at a catchment scale, which inevitably encompasses a range of communities with varying access to resources and capacities, requires a dynamic appreciation of balance and social equity. Without this there is a risk that isolated and vulnerable communities will be left to spectate as those with louder voices, greater savvy and more political linkage receive more investment (e.g. financial, emotional, temporal), simply because they are more able to manipulate the 'rules of the game' in their own favour. Such challenges lie at the heart of the social equity concerns that underpin the Sustainable Livelihoods Approach.

Austerity and the intense competition for the financial resources in the UK Government's Flood Risk Management (FRM) budget provided a backdrop against which many smaller communities were being encouraged to do what they could for themselves. Even large physical schemes in England now need a community contribution, but this case study describes how one such scheme has come to fruition. This was achieved through the concerted efforts of the town's Flood Action Group, the local authority and other flood-management agencies. The fact that physical defence structures formed such a focus of attention cannot, however, be ignored from a resilience perspective. This is because we should all be cognisant of the conclusive critique in the literature regarding the tendency of structural measures to increase rather than to reduce flood risk. In terms of resilience in the Derwent catchment, however, it remained the presence or lack of engineered solutions that went furthest toward underpinning people's psychological ability to manage the risks to which they remain exposed:

> "I don't know at which point you get to that … point of saying '*actually we have bent out of shape so much that there is no more elasticity; we have to change things*'. And that's not the same as returning to a normality. What we're talking about is there is fundamental transformation and I don't think we're there yet with flooding in Cumbria, because it's easier to build, to do the King Canute thing of trying to hold things back, rather than move great chunks of [our towns]." Interviewee: C47_M_1

What these investigations also revealed quite clearly was that resilience, as it is defined by the IPCC (2014) is powerfully represented along this catchment. It has, however, been won over a period of years through the experience of repeated (flood) events. It has also been won at higher cost to those directly impacted by those events than to those who have not

been. There is clear evidence of the capacity exhibited by the catchment's social, economic, and environmental systems to cope with a high magnitude flood event as well as with other disturbances. They have also responded to and reorganised themselves in ways that maintain their essential function, identity, and structure and they have adapted and learned, while also perhaps maintaining a capacity for transformation that may only truly be operationalised once some future tipping point is crossed. Whether the next high-magnitude flood to strike pushes one or more of the communities studied here over that remaining threshold remains difficult to assess.

This report has corroborated the understanding that, even in the close spatial confines of a short river catchment, different geographical communities need to access and utilise different resource sets and capacities to maintain their resilience to hazards. However, it has also identified that engaged Communities of Resilience Practice (CoRP) offer significant potential in working collaboratively toward disaster-risk reduction outcomes at these catchment scales. A challenge is also offered, however, in the way that CoRP's have been identified as requiring a truly inclusive remit. This involves formal agencies understanding and supporting each other's roles, in deliberating and delivering a full range of capacity-building civil- and social-protection solutions that reflect sustainable, equitable and achievable outcomes at every point along the Integrated Emergency Management spectrum (i.e. not just preparedness and response) and for all communities they serve.

In completion of the final aim, the set of qualitatively-determined indicators proposed in this report offers Communities of Resilience Practice potentially useful metrics with which to measure the resilience of their hazard-exposed population over time, but also a means through which to illustrate *to each other* the complex range of community attributes that they *each*, and therefore by association, they *all* need to nurture if their risk reduction mandate is to be achieved.

3. Introduction

This emBRACE case study was carried out with the participation and assistance of members of a complex amalgamation of geographical, interest and practice communities situated along the catchment of the River Derwent in the county of Cumbria, north England.

In terms of meeting the principal emBRACE aim of 'Building resilience to disasters amongst communities in Europe', this case study offered particular value, because it presented an opportunity to investigate the concept as it is operationalised across a range of hydrologically-linked topographical and social contexts i.e. from hill farms in the Lake District fells to the post-industrial port town of Workington that lies at the mouth of the river. The focus of the research was on understanding community resilience to hi-magnitude floods, because parts of this catchment have experienced at least two such events since 2005. The sample was 'snowballed' from within the multi-stakeholder 'community of resilience practice' that has emerged in the county as a result of the population's exposure these flood events, but also their experience of a wider range of emergency events that have also occurred since 2000; including a foot and mouth disease outbreak and a mass shooting.

3.1 Overall Research Aims

The stimulus for the emBRACE research in the north of England was to explore the relative contributions to the building of community disaster resilience of civil protection interventions, community engagement and broader social protection services and provision.

The framing of the problem as community *disaster* resilience pushes attention towards a primary reliance upon civil protection interventions (i.e. 'blue-light' emergency response). However, in line with disaster research that considers root causes of disaster vulnerability to lie in structures and practices at some distance from disaster events (Wisner et al., 2004), the research was formulated to explore this wider framework in a European context. The task was also to develop a set of indicators across the range of resilience domains in order that some approach to measuring this community attribute could be undertaken. This part of the research was guided by Norris et al.'s (2008) proposal that resilience should be understood to encompass multiple factors across Economic Development, Social Capital, Information and Communication, and Community Competence domains. Cutter et al.'s (2010) development of indicators that required publicly accessible national-scale data for analysis (with their inherent limitations), was also useful because this study sought to develop indicators that could be utilised at higher than county or municipality resolutions to provide civil and social protection service practitioners with a comparative image of resilience *within* these particularly important local-governance scales.

The overall aims of this emBRACE case-study were to explore community resilience in relation to its ability to mobilise different resource-sets and to identify the social dynamics at play, which can foster or conflict with this process. For this reason, and with some justification provided by Norris et al.'s proposed domains, this case-study adopted a Sustainable Livelihoods Approach (SLA) (Chambers and Conway, 1991a) to its analysis.

This is because the human, socio-political, physical, place-based and financial categorisation of resources used in SLA, along with its concerns for livelihoods' sustainability and equity and for peoples' capability to maintain those livelihoods are regarded as fitting comfortably within the resilience frame (DFID, 2011). Taking this Sustainable Livelihoods approach, this investigation contained the following three broad research aims:

1. To identify the resource sets required by a community to build resilience toward flood events and the capacities required to mobilise these resources.
2. To assess how social factors such as trust, accountability, cooperation, power and influence interact to influence the mobilisation of resources.
3. To devise indicators for components of the resource sets, action phases (mitigation, etc.) and social learning dimensions, which are at the heart of the emBRACE general framework.

4. Context of the case study

4.1 Hazards considered, reference events, general impacts (experienced or anticipated)

The population of Cumbria has experienced considerable adversity in the face of a range of hazards and threats[1] during the last 13 years. For example, the county was at the forefront of the Foot and Mouth disease crisis in 2001, which decimated local cattle herds and sheep flocks over a wide area as well as severely impacting the wider community and tourist industry (Convery et al., 2008). Further, in June 2010 local resident, Derrick Bird, murdered twelve people and injured a further eleven in a shooting spree (Chesterton, 2011). The county, has also, however, experienced repeated high-magnitude floods over this period, which have caused damage and disruption across the county and generated much press attention across the UK. All these events are still raw in the memory of residents and emergency services' staff, but whilst the wider experience of tragic events provides important context for any investigation of resilience in the county, this case-study focused primarily on understanding the relationship between the studied communities and flood hazards.

The floods that occurred in January 2005 and November 2009 are the most recent examples of extreme flooding in Cumbria. Several towns, villages and rural areas were affected in 2005, with Carlisle experiencing ~3,500 homes flooded and considerable disruption to

[1] In UK Civil protection terminology hazards include 'natural events' (e.g. floods) and major accidents, whilst threats relate to human actions undertaken with malicious intent. (HM Government, 2012)

energy and communications infrastructure (Cumbria County Council, 2005). The 2009 floods are the focus of this research. This event caused significant damage across Cumbria, but most notably along the Derwent River Catchment, as it flows off its headwaters in Borrowdale and St John in the Vale, through the towns of Keswick and Cockermouth and to Workington and the sea. During this event a nationally unprecedented amount of rain fell on a saturated ground (e.g. 314mm fell at one gauging station within a 24 hour period: Cumbria County Council, 2011: p. 8). This caused local rivers to burst their banks and surface water to overwhelm drainage systems. The high rainfall combined with shallow soils and steep hill slopes meant that the rain water ran off the land quickly resulting in flash, surface-water and fluvial flooding, which reached unprecedented levels as rivers burst their banks. This rapid rise of water levels was also exacerbated in parts of the catchment by poor drainage and near the coast, by tidal locking (Cumbria County Council, 2011: p.8).

The 2009 floods resulted in ~2,239 properties being flooded across Cumbria: 80% residential; 20% retail and commercial; and many schools were forced to close (Cumbria Intelligence Observatory, 2010: p.25-26). Severe travel disruption also occurred on roads and railways, with several bridges collapsing or needing to be closed for safety reasons. The collapse of the Northside Bridge in Workington resulted in the death of Police Constable Bill Barker. Power supplies and telecommunications were interrupted in some areas (including contact with the emergency services). Cockermouth was the worst affected town, where the depths of floodwaters reached ~2.5 metres and affected 80 per cent of businesses (Riding, 2011: p.1). It was estimated that the 2009 flood event in Cockermouth was a 1: 550 year event (Environment Agency, 2011). Over 800 properties were affected in Cockermouth compared to 300 in Keswick and 60 in Workington (Environment Agency, 2009: p. 6). Cumbria County Council reported damages to businesses concentrated in Cockermouth, Workington and Keswick at approximately £100 million (NERC, 2011: p.4)

4.2 Socio-economic-demographic context

Cumbria is located in the northwest of England and is the second largest English county, covering an area of approximately 2,600 square miles with a population just under 500,000. The county is divided into six local authority districts and boroughs. Cumbria contains all the mountains in England over 3000 feet and is widely regarded for its landscape value (Cumbria County Council, 2011a) and Areas of Outstanding Natural Beauty (AONB) (Figure 4.1). The landscape of lakes and mountains make it a popular tourist destination, and over the course of a year over 20 million tourists visit the county.

Despite Cumbria's long-term gradual growth in population, it remains one of the most sparsely populated counties in England (Cumbria County Council, 2011b). Cumbria has an ageing population with an influx of middle-aged and older people, with this influx taking place in parallel to an out-migration of young people in search of education, employment and social opportunity (Cumbria Rural Forum, 2010). Long-term projections suggest that these trends will increase, and by 2029 it is estimated that just over twenty nine per cent of the population will be over the retirement age, compared with twenty two per cent for England and Wales (Ibid.). This demographic trend also highlights a disparity between districts, with rural areas experiencing the most significant ageing-population effects. The employment structure of Cumbria differs from that of other regions and England as a whole, with a reliance on agriculture, hospitality and manufacturing and a low representation of finance, business services and education (Cumbria County Council, 2009).

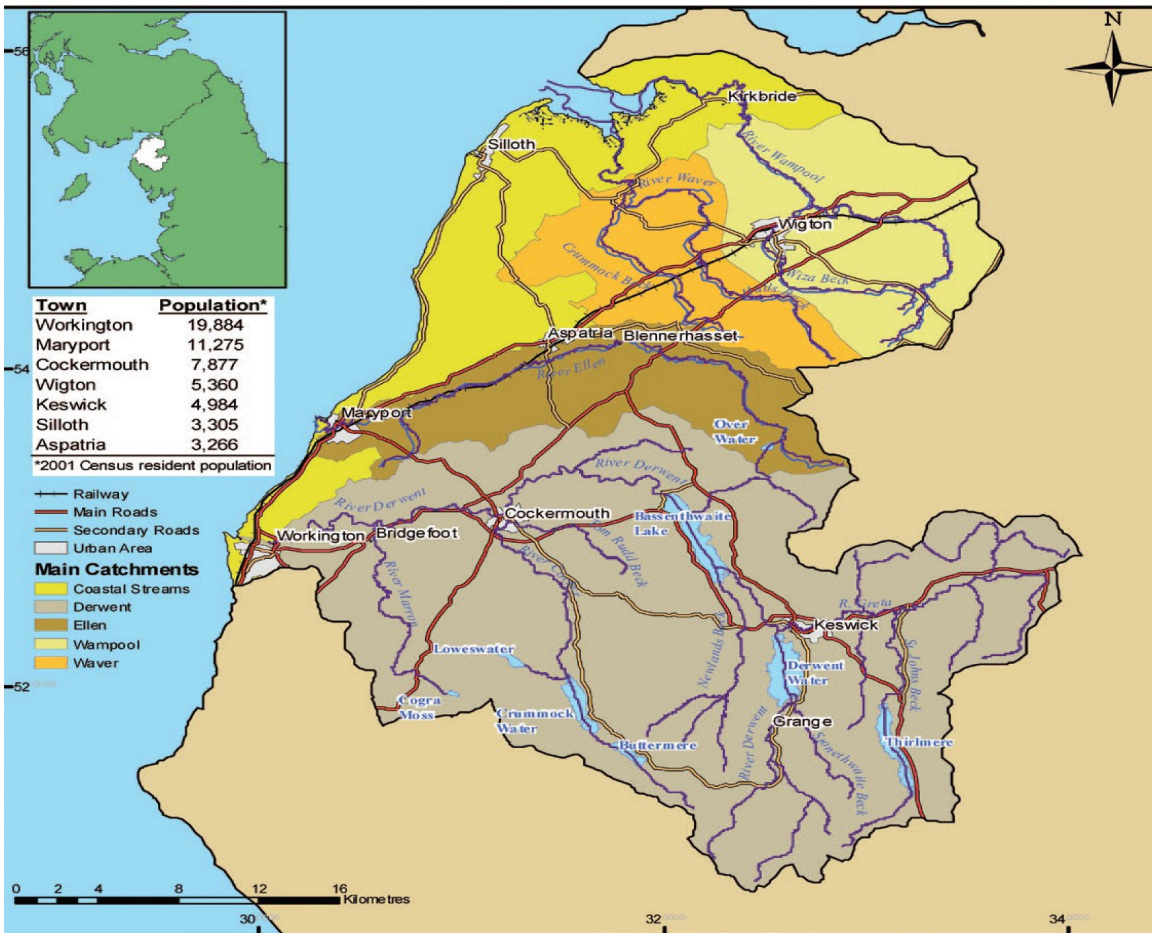

Figure 4.1: The River Derwent Catchment, situated in Cumbria North West England – note the locations of Keswick, Cockermouth and Workington (Environment Agency, 2009)

Life expectancy for Cumbrian males is the same as the England average (seventy eight years) and is one year below the English average for females (eighty one years) (Health

Protection Agency, 2012). On average two people live in each household in Cumbria with thirty one per cent of households without access to a private car, which may be reflective of the ageing population and/or deprivation. Although tourism in Cumbria provides jobs and wealth for many in the county, the region faces economic challenges that could impact the regional economy. These have arisen from a range of problems such as the 2001 Foot and Mouth Disease outbreak, competition from low-cost airlines and global tourism, the decline of traditional manufacturing industries, steelworks, mining and the on-going decommissioning of the Sellafield nuclear site (Cumbria County Council, 2009).

This case study focuses on the specific urban towns of Cockermouth, Keswick, Workington and surrounding rural village and farming communities, which were amongst the worst affected areas of the 2009 floods.

Cockermouth is located at the confluence of the River Derwent and the River Cocker, from which its name derives (see map Appx 5.2). The main street of Cockermouth, which is the town's main centre, hosts an array of largely independent businesses and shops. Much of the town's architecture is of Georgian and Victorian style (classic late 17th and 18th century terraced housing) made of traditional slate and stone. The town also has a series of small alleyways and lanes (often maintaining medieval street patterns) to the rear leading down to the River Cocker. The town of Keswick is situated within the Lake District National Park and lies on the River Greta and the adjacent Derwent River. The town is a popular tourist destination due to its hub location within the surrounding conservation areas (see map Appx 5.3. Workington is a post-industrial town at the mouth of the River Derwent. It is bounded to the west by the Solway Firth, part of the Irish Sea (see map Appx 5.1).

Cockermouth and Keswick represent more affluent towns, whilst Workington's population has the highest proportion of workers undertaking manual labour[2]. There are high levels of deprivation and high proportion of social housing in Workington (Cumbria County Council, 2011). Unlike Keswick, Cockermouth and Workington do not lie directly within the Lake District National Park, but Workington's situation furthest from the park boundary means that this town draws the least economic benefit of the three from the National Park's status.

Rural villages in Cumbria have a long agricultural history and this remains a key source of revenue for many Cumbrian farmers. However, direct employment in Cumbrian agriculture and supply-chain industries accounts for only around 3.1% of employment, generating £150

[2] Cumbrian County Council Urban Area Profiles cites 22 per cent of Workington residents undertaking manual labour, in comparison to 11 per cent for managerial/technical; 6 per cent for skilled occupations and 2 per cent for professional occupations (figures based on Office for National Statistics, Information and Intelligence, 1999).

million in Gross Value Added in 2006, down from £235 million in 1996 (Cumbria County Council, 2009). The rural economy faces challenges from land management reform and increasing focus on the sustainability of rural communities (Ibid.). Traditional farming practices have come under scrutiny in more recent years and farmers are now expected to take part in more sustainable farm and land management practices. Many farms cannot rely solely on agriculture and are having to diversify into other areas, such as tourism and hospitality. Other key challenges faced by the rural population include: deprivation, poor access to services, education, housing and unemployment (Cumbria Rural Forum 2010) as well as the ageing population.

This case study included rural areas and villages within and around the Derwent catchment, including Borrowdale, St. John in the Vale, Low Lorton and Braithwaite.

The village of Braithwaite is two miles west of Keswick and lies within the boundaries of the Lake District National Park (see map Appx 5.4). Braithwaite has a population of about 1,185 in 665 households although around 18% of properties in the parish receive 50% discount on council tax (suggesting that they are holiday homes). Braithwaite is situated on the Coledale Beck and adjacent to Newlands Beck, which merge north of the village and flow into Bassenthwaite Lake.

The village of Low Lorton lies on the River Cocker five miles south of Cockermouth and 8 miles west of Workington and sits within the Lake District National Park (see map Appx 5.5). Low Lorton and the adjacent High Lorton, combined, have a population of about 250 (Cumbria County Council, 2011).

The Borrowdale valley lies three miles south of Keswick and sits within the Lake District National Park. Much of its land belongs to the National Trust (29,173 acres), including 11 farms and a Parish population of 438. Historically farming was the main industry but it has become increasingly popular as a tourist destination. The River Derwent rises in Borrowdale before it passes through Derwent Water and on west to Workington.

St John's in the Vale is a glacial valley also in the National Park that lies four miles from Keswick. St Johns Beck, which is the principal outflow of Thirlmere Reservoir runs northward along the vale before joining the River Greta and flowing through Keswick.

4.3 Context – UK Civil Protection and Flood-Risk Management (FRM) Policy

This case study investigated the respect roles of UK Civil Protection (CP) approaches to flood-incident management and the wider flood-risk management and how they influence the resilience to flood hazards at community resolutions. Accordingly, it is important to provide an overview of civil protection legislation in relation to flooding, particularly as considerable changes have been affected in this practice in response to a number of nationally significant flood events that have occurred over the past decade.

4.3.1 National policy context

Since 2004 UK Civil Protection (CP) has been regulated under the Civil Contingencies Act 2004 (CCA). This legislation defines what the term 'emergency'[3] means and places statutory duties upon formal agencies, which it labels as Category 1 and Category 2 responders[4], and it lays out what these responders must do in order to comply with the legislation. The principle duties placed on responders are: risk assessment; business continuity management (BCM); emergency planning, and; maintaining public awareness and arrangements to warn, inform and advise the public about emergencies (HM Government, 2012). This clarification of roles has been referred to as an enabling of the Resilience Agenda, proposed by Granatt and Macintosh (2001), which conceptualised resilience in CP as being able "*at every relevant level to detect, prevent, and, if necessary, to handle and recover from disruptive challenges*" (Cabinet Office, 2003). These resilience-focussed duties were to be delivered through an Integrated Emergency Management (IEM)[5] approach that centres on the Local Resilience Forum (LRF); a collective of responders who meet regularly and during emergencies to coordinate and monitor risks and responsibilities at the scale of a police area (i.e. usually county scale in England).

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[3] CCA (2004) defines an emergency as: "An event or situation which threatens serious damage to human welfare in a place in the UK. An event or situation which threatens serious damage to the environment of a place in the UK. War, or terrorism, which threatens serious damage to security of the UK." (CCA, 2004)

[4] Cat 1 Responders are the main organisations involved in most emergencies at a local level (e.g. emergency services (Police, Fire & Rescue etc.) along with health sector and local authority partners). Cat 2 responders are those organisations involved in some emergencies (e.g. utilities and transport companies) (HM Government, 2012: p.7)

[5] The six phases of IEM: Anticipation, Assessment, Prevention, Preparation, Response, Recovery Management

In England the Department for Food and Rural Affairs (Defra) bears responsibility as Lead Government Department (LGD) for managing flood response, with the Department for Communities and Local Government (DCLG) acting as LGD for flood recovery (Defra, 2013a). The Environment Agency (a Cat 1 Responder) bears primary responsibility for managing main-river[6] and coastal flooding with, since the inception of the Flood and Water Management Act (FWMA) in 2010, Local Authorities, acting as Lead Local Flood Authorities (LLFA). LLFAs bear statutory strategic responsibility for investigating, reporting and coordinating the management of flood risks related to ordinary watercourses, ground and surface water. The Environment Agency (EA), however, retains strategic overview for all types of flooding; wherein the EA aims "to support partners' response where it can" (Defra, 2013b: p.17).

Initial assessments of the CCA established its effect on UK CP practice as a formalisation of largely pre-existing civil contingencies arrangements that had been in place for many years (Walker and Broderick, 2006), with the FWMA seeking to remove some of the fragmentation specific to the water sector that had been criticised so strongly following the 2007 flooding (Pitt, 2008). In effect, the legislation could be regarded in familiar top-down terms, but with responders now focussed on delivering their emergency (i.e. in this case, flood) related duties through the systemised multi-agency LRF approach. High-level outputs related to this approach have included the development of a framework related specifically to flood incident management and rescue coordination that structures and integrates the respective roles of all formal responders during a flood emergency (Defra, 2013b).

Engaging the wider population with CP and Flood Risk Management (FRM), which had been carried out mainly through the duty to warn and inform (NSCWIP, 2007), rather than in terms of a comprehensive engagement strategy has, however, evolved since 2004. Over the last decade English FRM policy, led by Defra's 'Making Space for Water' strategy (Defra, 2005), has come to represent a clear example of 'the privatisation of risk' (Steinführer and Kuhlicke, 2009), wherein there is an increasing downward pushing of responsibility for managing flood risk from governments right down through to individual households (Watson et al., 2009). What this down-shifting has facilitated appears to be the integration of a much wider range of stakeholders (e.g. businesses and grass-roots community groups) into the whole IEM and

[6] In England main rivers are designated by Defra, with the Environment Agency's powers to carry out flood defence works applying to these rivers and flow-regulating structures thereon only. Every other open watercourse in England and Wales is determined by statute as an 'ordinary watercourse'

FRM process. Such 'responsibilization' (Kuhlicke and Steinführer, 2010) of communities and individuals is further evidenced by a shift in the funding arrangements for flood and coastal management that occurred in 2011.

From this date the funding criteria for flood defence schemes (i.e. largely physical defence structures) changed from a national system based on priority scoring across all proposed schemes in the country (i.e. with the highest scoring schemes receiving funds) (EA, 2008) to a system whereby scheme stakeholders were encouraged into a process of partnership funding, where Defra offered to contribute toward a scheme, on the understanding that a proportion of the total budget would be met by contributions from the non-government sources (Defra, 2011a). Whilst the idea was developed in order that "more schemes are likely to go ahead than under the previous 'all or nothing' funding system", a House of Commons committee revealed in 2013 that only limited funds had been attracted from other sources, most of which came from local authorities who were already "facing their own funding challenges" (EFRA, 2013). The implication being that even the low levels of top-up funding evidenced were only being provided by local authorities at considerable opportunity cost to their other priorities. As LGD for flooding, Defra has, however, also strived to engage communities directly with their flood risks, with the flood management strategy published in 2011, entitled 'Understanding the risks, empowering communities, building resilience' (Defra, 2011b), which encourages a full range of stakeholders to participate in risk management activities as well as supporting the creation of Flood Action Groups. Defra has also funded a range of non-structural FRM projects, including research into the efficacy of property-level protection (PLP) (Harries, 2009, Merrett, 2012).

4.3.2 Refocus on 'Community Resilience'

Following the wide-area flooding across the UK in 2007 the resilience focus in UK CP and FRM shifted slightly in terms of flood emergencies specifically, when Sir Michael Pitt, in his review of the response to those events recognised that:

> Many communities showed themselves willing to pull together. Helping neighbours became second nature, and we have heard many stories of community spirit and engagement. So we strongly endorse the announcements in the National Security Strategy relating to the promotion of **Community Resilience** by government in partnership with local organisations. (Pitt, 2008: xxxiv - emphasis added)

This aspiration for community resilience to become a substantive CP outcome was adopted as a national framework of non-statutory guidance in 2011 (Cabinet Office, 2011). Within this document, however, community resilience was defined as a community attribute that

focussed on their capacity to harness "*local resources and expertise to help themselves in an emergency, **in a way that complements the response of the emergency services***" (Ibid, p.11: emphasis added). Although limited in its focus, this understanding of community resilience as a supplement to the formal response came at a time when flood emergencies were continuing to plague the UK and the emergence of an increasing number of grass-roots Flood Action Groups (FAG). What was obvious with this emergence, however, was that instead of considering themselves as community 'responders', these FAGs were taking on activities that reflected all aspects of the IEM approach, with local advocacy for flood-risk mitigation (i.e. flood prevention measures) forming as important a part of their community-protective activities as were developing protocols for (e.g.) delivering neighbourhood door-knock warnings. Further enabling the expanded and in many respects 'political' emergence of FAGs as local advocacy groups has been the influence of the National Flood Forum, a 3rd sector organisation which has become a crucial link between policy and hazard exposed communities (e.g. the NFF directly assists communities in setting up FAGs, it commissions research and advocates for communities at government level: Harries, 2010, NFF, 2014)

4.3.3 Local context – Flood Action Groups and the Community Emergency 10-Step Plan

Following the severe impacts of flooding in 2005 a number of Flood Action Groups formed in the affected towns across Cumbria (often with initial assistance from the NFF). In the River Derwent catchment the two main FAGs represented the flood affected towns of Keswick and Cockermouth. In Cockermouth the group's activities were mainly focussed on achieving greater protection for the Goat area of the town, which was flooded again prior to the 2009 event's impact on the much larger town area. Both these groups engaged with the formal responder and FRM agencies and developed close working relationships that assisted in laying the foundations for major structural defence schemes, as well as in developing grass-roots response management capabilities. Keswick FAG, particularly, developed contingencies that actually supplemented the actions of the formal agencies during the response phase, rather than simply 'complementing' them. For example, the fact that KFAG had installed a dedicated telephone line into the town hall for emergencies the day before the flood, enabled a lot of the coordination to be carried out from that building, with community members and responder staff working together.

The KFAG Community Emergency Plan (CEP) is now even more sophisticated and encompasses numerous specific actions to be coordinated and taken chronologically by community volunteers, from the initial broadcast of a severe-weather warning, through the

monitoring of river-level thresholds, to the point where volunteers need to retreat from flood-affected areas before they are inundated.

In addition to the FAGS in the towns the 2009 event stimulated local 3rd sector organisations Cumbria Council for Voluntary Services (CCVS) and ACTion for Communities in Cumbria to begin to work more closely with the Cumbria Resilience Forum (henceforth, the LRF) to deliver a community-level emergency planning framework. This workstream was financed through several avenues, including through national funding organisations such as the Big Lottery as well as the locally-based Cumbria Community Foundation (CCF) and other charitable funds. What emerged was a process through which predominantly rural populations, some of whom had suffered significant disruption during the floods, could develop their own Community Emergency Plan (CEP). This process became known as the Ten-Step plan (Table 4.1 shows the ten-steps of the planning process) (ACT, 2012).

Step	Action
1	Getting Together
2	Organising the work
3	Knowing the Unknowns
4	Identifying Skills and Resources
5	Resolving legal disputes
6	Organising key facilities
7	Keeping in touch
8	Activating your Emergency plan
9	Taking Control
10	Testing your plans

Table 4.1: The Community Emergency Planning – 10-Step Route Map (ACT, 2012)

The underlying ethos for the encouragement of emergency planning by rural communities reflected the fact that during the flooding , many local communities did not receive assistance from the formal responder agencies for many hours:

> "…it wasn't my problem; my task was to manage the [particular urban area]. Obviously globally, you know Gold Command was set up; there was a Strategic Coordinating Centre, but my experience of the [rural valleys] etc. is that they were all there to fend for themselves." C13_M_1

This problem, where communities found themselves without support was not, however, restricted to the rural areas:

> "We phoned for sandbags didn't we? And my reply was 'Oh they've all gone to *[the other town]* because its flooding you know' and I said 'Yes and so is [our town] and they couldn't answer me." C27_M_3-3

Due to the fact that so many communities had found themselves dealing with events unprepared, the LRF supported the 10-step plan in a concerted effort to engage communities with the planning process. This has resulted in increasing numbers of groups being formed:

> "…that was something that the [Cumbria Resilience Forum] whole-heartedly supported and said, I remember we spent a whole afternoon on it, the work that [ACT] did was first class in my view, in terms of tapping into local people, providing them with the tool kit. Because I think that's often the problem, people speak about business continuity and emergency plans and things and it sort of scares people off, they think it has to be some kind of fancy, formal technical product and it doesn't. It's just very simple." C10_M_1

Organisation of these rural groups can be undertaken as a workstream by Parish Councils, whose formal status offers connection to a ready structure through which professional civil-protection partners (e.g. ACT, EA) can channel advice and support. So whereas the Keswick and Cockermouth groups formed independently as grass-roots groups, with the approval and assistance of the parish, town, district and county councils, but separate from them, the 10-step groups have had much more facilitation from the LRF members, especially the EA, and ACT. In rural areas this was not, however, a straightforward case of the councils readily extending from their usual responsibilities:

> "I remember the Chairman of the Parish Council saying 'I haven't got a clue what this is all about, we haven't got any money, we haven't funds, we haven't got any resources' and all the rest of it. But now basically what they have been told to do is start planning" C61_M_1

If groups emerge that are not naturally affiliated to a parish council, then encouragement has always been given by the LRF partners for them to seek formal constitution. Constitution opens up wider opportunities for funding to be directed to groups who present a compelling case for financial assistance in developing risk-mitigation solutions (e.g. to assist in funding the installation of Property-Level Protection (PLP) in certain properties).

> "…the fact that you've got a group that's come together to deliver something, that you've checked that they are properly constituted, or if not you've pointed them in that direction, you then make sure they've got a bank account, they've got processes in there, then they are a group that's going to carry on." C24_M_1

The Ten-step plan is also promoted by the local authority through its legal requirement as Lead Local Flood Authority (LLFA) to conduct local meetings to discuss FRM with exposed or flooded communities:

> "…And then as part of that we're able, through the 10-Step Plan, to say to communities 'well have you thought about your own personal household resilience, not just flooding but other issues as well?' […] that's why the [Resilience Forum] supported developing the 10-Step Plan; it's something that we've always wanted to achieve and it was just helpful that ACT had the funding that they had from the Lottery to be able to put in that final push to get it through." Hi-Level interviewee C24

This participatory 10-step planning process has included a number of workshops, organised collaboratively by the 3rd Sector and Responder partners, where mixed delegations of professionals and community members work together to learn about emergency planning, to showcase existing plans, to validate plans and to encourage and facilitate the development of greater planning uptake.

5. Methodological approaches

This case study was conducted using a mixed methodology, which included interviews, workshops and social network analysis. The fieldwork was conducted over the period of approximately one year, between July 2013 and July 2014, with the research being carried out by a team of UoN staff. Sixty-five interviews were completed using a snowball sampling method (section 5.3).

5.1 Defining 'Community'

A principal concern across the project, which was enunciated within the first deliverable (Birkmann et al., 2012) was the importance of understanding which 'community' was actually being referred to in any reference to community resilience, i.e. there is a need to define the 'resilience of what?' question (Carpenter et al., 2001). What was laid out in that deliverable was a simple typology of community types, which could be used to distinguish any particular social grouping under investigation. These types were, communities of: geography; interest; circumstance; supporters/practice and; identity.

In developing the research method that would underpin this case-study research it was realised that in looking at a population spread along the full length of a river catchment, it was likely that multiple types of community would be revealed. This was indeed the case. However, the 'snowballing' sample selection criteria undertaken in this study (section 5.3) did point toward one specific community type over the others; the community of support/practice. However, this could be more usefully defined. In a civil-protection context,

communities of *support* are understood as being those communities "within organisations that provide emergency response services" (Cabinet Office, 2011: p.12). In this instance, the Local Resilience Forum (see section 3.3) could be regarded as such a community. However, communities of *practice* have been defined much more inclusively, not only in terms that better encompass integrated emergency management (i.e. not just in terms of 'response services' alone) but also in terms of stakeholder inclusivity. Communities of practice are understood as:

> "…groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an on-going basis" (Wenger et al., 2002: p.4)

Treating the wider LRF/FRM network in Cumbria as a practice community enabled the team to 'snowball' perspectives from the full range of actors involved in flood management along the Derwent. However, the method also created opportunities to reach out beyond these often closely networked contacts, into the wider community of circumstance where weaker ties connected 'practitioners' to flood-affected people whom they knew also had insights to reveal.

In addition to being guided by the concept of community of practice, the role of social networks in disaster response and other resilience-relevant activities is well documented (Aldrich and Meyer, 2014, Cordasco, 2006, Dynes, 2005a). Accordingly, the research used a social-capital lens to investigate whether, and if so how, resilience thinking was propagating through the community of practice and out into the geographical communities along the Derwent catchment. Particular interest was taken in identifying the respective roles of bonding (within tight family or interest groups); bridging (laterally through weaker ties to other community-based networks) and linking (hierarchically, in order to draw or to project political/power-based influence into practice-based activities).

5.2 Applying the emBRACE Framework

In applying a range of different predominantly qualitative methods it was important to retain a focus on developing a methodology that would complement any analysis structured around the emBRACE framework (Fig. 5.1) and the consortium-preferred definition of resilience (IPCC, 2014)[7].

[7] emBRACE preferred resilience definition: "The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways

Figure 5.1: The emBRACE Community Resilience Framework

This case study's main focus was on developing qualitative understandings of interactions across all three framework domains (resources/capacities, actions and learning), but this investigation was always intended to explore the flood-affected communities' differential access to resources and capacities. This focus was guided by the Sustainable Livelihoods Approach (SLA) (Chambers and Conway, 1991b) and supported by the re-adoption/adaption of the SL approach by the Department for International Development (DFID, 2011).

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that maintain their essential function, identity, and structure, while also **maintaining the capacity for adaptation, learning, and transformation**" (IPCC, 2014, emphasis added).

Considering resources and capacities from an SLA perspective, involves categorising them, typically, in terms of human, social, natural, technological/physical and financial/economic capital. However, we also agree with Tobin's (1999) suggestion that to understand resilience across any scale of society, there is an imperative to also explore the undeniably social concept of the 'Political' (and the 'political'). Table 5.1 details how resources and capacities have been categorized in relation to this case-study, with the political explicitly integrated into the social, as an acknowledgement that it is within the negotiation and power play that forms the key component of social relations that the clearest manifestation of the political occurs.

Human Resources and Capacities	Health (physical and mental), work, knowledge, skills, education, self-esteem and wellbeing. These are fundamental resources for anybody and without which it is difficult to make use of the other resource sets.
Socio-Political Resources	Family, friends and informal networks; more formal membership of groups; trust relationships that assist in collective action and knowledge-sharing. Obviously associated with social resources, political resources are manifest in the power and capacity to influence political decision-making (through formal and informal participation in and/or access to political processes); hazard management legislation and standards.
Financial Resources	Earned income, pensions, savings, credit facilities, benefits, access to insurance.
Natural/Place-based (Wilding, 2011)	Protecting and developing ecosystem services (in this context especially those that offer degrees of flood protection such as an operable floodplain, appropriate flood defences); land, water, forests and fisheries (for direct exploitation as well as more indirectly for personal wellbeing etc.); cultural/heritage resources; local public services, amenities, and access to jobs and markets (the availability of access rather than having employment which is covered by human resources). In-situ (legacy) housing, roads, water and sanitation systems, transport, communications and other infrastructure
Physical Resources	Structures, tools, equipment and premises related specifically to the 'work' of hazard mitigation.

Table 5.1: Resource sets for sustainable livelihoods (after: Chambers and Conway, 1991)

Acknowledging the multi-scaled influences of socio-political capital is vital in this context, because rather than just to assume that 'resilience' to hazards can be achieved simply (i.e. if we were only to do the right thing with the resources at hand), the inclusion of the political into our framework necessitates, as already implied, an appreciation of distributional effects and the potential for social in/equity, i.e. whether those equity concerns are founded in the dynamics of, e.g. deprivation, gender or a rural-urban divide . Linked too with this concern over equity are the two other conceptual metrics of this approach, capability and sustainability. Capability here is considered "as being able to cope with stress and shocks and to make use of livelihood opportunities" and sustainability as the "ability to maintain and improve livelihoods whilst maintaining or enhancing the local and global assets and capabilities on which livelihoods depend (Ibid. p.5.). Adapting the original SLA categorisation, this report also proposes that the concept of 'natural' resources, which imply an element of the pristine (i.e. untainted by human hand) should be couched in more realistic terms. We adopt the idea of Wilding (2011) by considering geographical context in terms of 'place-based' resources. Such definition allows for the acknowledgement that the environment at risk of flood bears a physical legacy of alteration and management that has put in place countless structures, services and systems that are irremovable from any consideration of landscape. Placing such community assets as buildings and infrastructure into this category also allows for the conceptual understanding of 'physical resources' to be focussed on accounting those assets that perform specific work in relation to flood risk management (e.g. bunds, flood walls, Property-Level Protection (PLP) devices and flood-warning systems).

Whilst the emBRACE framework (Fig. 5.1) has value as a heuristic for explaining community resilience, the dynamic interactions across the component domains (resources/capacities, actions and learning), present a seeming knot of complexity that confounds simple explanation. Many of the observations presented in section 6 could clearly bear interpretation across two or even all three domains, but for the sake of reporting and in assisting the development of structured conclusions, having a single predominant categorisation is useful. Accordingly, key points of relevance that emerge in section 6 are then summarised and tabulated in section 7, relative primarily to their association with the resources/capacities domain, secondarily to actions and in tertiary to learning. As Twigg has previously pointed out in relation to community resilience:

> "Without a structure of this kind it would be impossible to find one's way through the many diverse characteristics of resilience. But, like all frameworks, this imposes somewhat artificial distinctions between different aspects of the subject. There is actually much more connection and overlap, and many individual Characteristics of a Disaster-Resilient Community could appear under more than one Thematic Area or Component of Resilience. There is a danger

– as there is with any framework – that one will over-separate the different elements and overlook the linkages between them. These connections across the different themes and components must be kept in mind." Twigg (2009: 13)

5.3 Sampling strategy

One of the most interesting features of the Cumbria flood experience, which made the case-study so attractive to research, was the fact that Derwent-catchment based Flood Action Groups had been at the vanguard of the locally-affected population's attempts to better manage their flood risks. An important factor in sample selection was that members of the case-study team had already developed research relationships with key informants within the affected local population (e.g. flood-affected residents and their 'supporters' from various formal institutions). These relationships had evolved since initial contacts were made in the months directly after the 2009 flood event, with several of these key-informants, for example, having taken part in a workshop organized by the Lancaster University team that had conducted award-winning ESRC and Environment Agency funded research on flood recovery in Hull, UK, following the devastating flood there in 2007[8] (Whittle et al., 2010). These pre-existing relationships meant that there existed an element of trust between the research team and these informants in relation to how they expressed their own stories. However, it also meant that they were prepared to act as facilitators for the team, by offering names and opportunities through which to engage a wider sample of participants into the project. In effect this represented a 'snowball sampling' strategy (Robson, 2005), which ultimately led to the identification of 65 respondents. Collaborations with local stakeholders also opened up the opportunity to use community links that had been developed by a local 3rd sector organisation in a separate catchment (Ullswater) to run a discrete community resilience workshop. This event, which was jointly delivered by UoN and WSL, became the emBRACE 1st stakeholder workshop, which was fully reported in emBRACE report D6.3.

5.4 Interviews

A total of 65 people were interviewed for the project along the length of the catchment, with participants either being interviewed on a one-to-one basis, in pairs or in small groups (with a maximum number of 4 previously-acquainted individuals). Interviewees represented a range of interests, from directly flood-affected individuals from either rural or town locations, to representatives of high-level governance institutions within the county (e.g. Cumbria County Council) and local 3rd sector service-delivery organisations. Table 5.2 illustrates the spread of interviewees between the locations and institutions wherein the individuals have

[8] http://www.lancaster.ac.uk/lec/sites/cswm/Hull%20Floods%20Project/HFP_home.php

been attributed a single domain. However, due to the nature of the research and the predominant 'snow-balling' recruitment method employed, several of these individuals were able to provide insights from more than one perspective (e.g. several interviewees categorized under 'hi-level institutions' actually lived in a study town or area and regarded themselves as directly or indirectly flood affected. Accordingly, these individuals were able to legitimately provide direct first-hand accounts of their personal flood-related experiences as well as describing their professional perspective). All interviews were recorded and the recordings transferred at the earliest opportunity to the UoN secure hard-drive for later analysis. The interviews were semi-structured in format (Oppenheim, 2004), with the interviewer being guided by a set of question topics (Appx. 1)

Domain/location	Interview participants
Hi-level institutions	25
Rural	6
Keswick	13
Cockermouth	10
Workington	11
	65

Table 5.2: Interviewees by location

In respect to the ethical considerations of anonymity and informed consent, all interviewees and other participants were asked to read and sign a consent form prior to participating in any formal research activity from which data was directly recorded (i.e. interviews and team-facilitated group meetings). All original interviews were then fully transcribed and anonymized prior to analysis using Nvivo™ Qualitative Data Analysis software. In order to incorporate selective quotations into outputs, the anonymisation was carried out by way of allocating a coded unique reference number (URN) to each interviewee. This URN was broken down by participant number, gender and community-related affiliation (Table 5.3), e.g. the first interviewee was female and worked for a county-scale 3rd sector organisation, hence she is identified by the URN C01_F_3-1. Where the selected quotations are drawn from interviews and take the form of question and answer, they have been labelled Q for Question and P for participant (if more than one participant was being interviewed at the same time responses are denoted P1, P2 etc.)

The separate Social Network Mapping (SNM) tasks required the analyst to work with original transcripts in order to prevent any confusion that could occur between the use of actual names or attributed pseudonyms. For security, these original transcripts were analysed by a UoN team member through the UoN password-protected secure hard drive. All original

names were then removed from the SNM spreadsheet prior to delivery to SEI team members who used dedicated software to create the network maps. For these tasks a slightly modified URN categorization was required, due to the inclusion of the additional networked contacts that were identified through this analysis (see section 5.7). All original recordings and transcripts will be destroyed at the conclusion of the project, leaving only anonymized resources for re-analysis.

Participant no.	C00	
Gender	M/F	
Institution	1	Governance - Nat/County scale
	2	Governance - District scale
	3-1	3rd Sect - County
	3-2	3rd Sect - District
	3-3	3rd Sect - FAG
	3-4	Faith-based
	4	Community member

Table 5.3: Interviewee coding regime

5.5 Workshops

5.5.1 Data providers: preliminary D3.2 Disaster Footprints workshop

In order to assist project partners in the development of emBRACE Del 3.2 Disaster Footprints and maps report, a small workshop was held in Carlisle. This event was focused on identifying the types of data that could be available in the development of a Community Disaster Resilience Assessment (CDRA). Accordingly, the delegation comprised data-management specialists from several Local Authority departments and partner agencies.

5.5.2 Ullswater Community Resilience: D6.3 Stakeholder workshop

Working in collaboration with ACTion for Communities in Cumbria (ACT), an influential local 3rd sector organisation, the project team took the opportunity of running the project's 1st Stakeholder Workshop[9] in Patterdale, beside Ullswater. Whilst this location (and its population) falls outside the case-study's principal fieldwork area (i.e. the Derwent

[9] Project milestone (MS) 24

catchment), the event was useful because it provided an opportunity for the team to directly assist ACT and the Lake District National Park Authority (LDNPA) in further developing a strand of work they had started in the area related to climate change adaptation (McCormick and Harrison, 2013). The report that resulted from this workshop (Del 6.3) has been adopted by the LDNPA and is now linked from its website[10].

5.6 Observations at community events

Team members also attended a total of 7 Community-Resilience focused events at different venues in Cumbria. These events were run by Environment Agency, County Council staff or by 3rd-sector or community groups and offered the opportunity for the researchers to observe the interaction between community members and the formal responding agencies. Team members participated at these events by asking questions and/or discussing the progress of the project. Notes were made at these events, which were included in subsequent analyses.

Date	Title	Location	Organiser
Oct 2012	Northern Flood Action Group (NFAG) – 3rd Annual Conference	Carlisle	NFAG
Oct 2013	Multi Agency Response to Flooding	Whitehaven	Cumbria County Council Resilience Unit
Nov 2013	3rd Annual Open Meeting, on river management	Lorton	Melbreak Communities
Jan 2014	Community Emergency Plan – Inception Meeting	Workington	Environment Agency
Mar 2014	Keswick Flood Recovery Group (KFRG)	Keswick	KFRG
Mar 2014	Community Emergency Plan – Update Meeting	Workington	Environment Agency
Oct 2014	"Building Resilience – Now And For The Future"	Penrith	Cumbria Resilience Forum

Table 4.2: Community Events attended

[10] http://www.lakedistrict.gov.uk/caringfor/projects/valleyplanning/ullswatervalleyplanning

5.7 Qualitative Data Analysis

Once transcripts and other notes from the various research activities had been produced, they were imported into the qualitative data analysis (QDA) software package Nvivo© to facilitate a grounded analysis (Strauss and Corbin, 1998). The initial QDA took the form of re-reading the texts, notes and images in order to identify codable phenomena, with the codes emerging from the analysis covering a full range of subjects. This collation of codes created a dataset of quotes that could be understood as revealing the range of participant perceptions and attitudes toward identifiable resilience relevant phenomena. Using the two research frameworks (SLA and emBRACE) as guides, these phenomena were then classified into themes that covered concepts such as community, IEM (actions), resources and capacities (including governance) and learning (Appx 2). It is through this illumination of the multiple themes and the complex, sometimes contradictory, aspects of phenomena that a richer and more informative picture can be revealed and more encompassing explanatory theories deduced. Once themed and explored for their explanatory value, internally within themes and across other themes, the coded text was finally analysed to select key quotes that would be capable of illustrating particular phenomena for explanation.

5.8 Social Network Analysis

Social network mapping is being undertaken in collaboration with associates at the Stockholm Environment Institute (SEI York and SEI Oxford). On the 15th October 2013 a workshop was held in Keswick with 11 participants to identify social networks drawn upon during the response and recovery phases of the 2009 flood. The workshop acted as an exploratory session to assess whether it would be appropriate to further investigate social networks in the context of this study and also to recruit Keswick participants for follow-up interviews. Initial results (Taylor et al., forthcoming), suggested that further network analysis could be useful in developing a clearer understanding of how the Cumbria 'community of resilience practice' operates.

Accordingly, a second social network mapping exercise was designed to: 1) identify what type of support/resources (e.g. physical, social, emotional, financial) were sought by members of the community before, during and after the 2009 flood; 2) identify gaps in resource flows; and 3) identify which actors represent key brokers and barriers to accessing these resources.

Data on social networks was obtained by analysing the 65 semi-structured interview transcripts and local workshop outputs (see section 5.6). Although social network analysis was not part of the original methodological design, social networks did emerged strongly in

this analysis and provided important foundations for conceptualising explanatory hypotheses related to social capital and the role of networks in mobilising resource sets. However, as the research design did not factor in specific social network questions a degree of caution is required in the interpretation of the results of the mapping exercise and this will be reflected in any supportive narrative.

Social network data included details about the networks of individuals and organisations (actor-based data) as well as information on the purpose of the network connection/ exchange between individuals and organisations (relational data). A sample of the social network data related to two key individuals is attached at Appendix 3. Initial analysis involved identifying the prominent actors within a network through the calculation of the highest scores against *betweenness centrality* (over 500) *and degree centrality* measures (over 25). Betweeness centrality measures the indirect connections of each actor and is derived from counting the number of shortest paths between individuals in the network. Betweeness centrality results in identifying individuals who are key conduits of information and illustrates a broader network with indirect connections and integrative sub-networks (Cassidy and Barnes, 2012). Degree centrality simply denotes the number of actors that are connected to an individual as an overall measure of network integration (Ibid.). Substantive details of the overall coding and analysis strategy and outcomes of the social network analysis will be presented in the forthcoming joint emBRACE WP4 deliverables 4.2 and 4.4, but an example of a SNM mapping output is detailed in Box 6.1 (section 6.3.1).

6. Resilience in the Context of Capacities/Resources, Learning and Actions: Insights from the North of England

6.1 Introduction

This section is split into two principal parts to describe the research exploration of, respectively, the rural farming and rural village communities and those in the three main case-study towns; Keswick, Cockermouth and Workington. The section takes a narrative style to describe factors, which emerged during analysis as bearing particularly relevance to resilience, with short sections to summarise these findings through an SLA lens.

6.2 Rural Resilience

The rural community investigated can be roughly split between the upland farms and the villages. The resilience against hazards of even these two interlinked groups displayed

interesting differences and an attempt at aligning the discussion with framework elements relevant to each section has been attempted.

6.2.1 Rural resilience: Farming

Hill farming in Cumbria underpins much of the Lake District tradition and culture that make the National Park so popular. Yet, the challenges presented by reduced profit margins, low expectations in relation to farm succession (i.e. retiring farmers not being replaced by a younger generation), reduced incentives to farm sheep and to use the high fell for grazing, along with the sheer physical challenges of this type of farming, mean that without targeted interventions traditional hill-farming livelihoods were already under threat before the 2009 event (Mansfield, 2011). Whilst these farming traditions are based on a powerful ethic that could be summed as "Farmers just want to farm" (C03_M_1), these pressures have meant that diversification activities can now be the profitable mainstay for farms, with the farmer's partner or spouse (typically organised along traditional gender roles) running the household as well as (e.g.) operating a Bed and Breakfast or holding down a full or part-time job off the farm, in addition to assisting on the farm at busy times:

> "…we have quite a lot of stock, a biggish farm and there's only [Margaret] and me and my dad and my dad's 70 this year so it's just how far you go. Bed and breakfast and farming. And [Margaret] works as well; she has a part time job as well, so. And the bed and breakfast and [Margaret's] part time working make more money than the farm." C54_M_4

Notwithstanding flood risks, the hill-farming 'community' could, therefore, be regarded as resilient in the sense that it has maintained its overall function in the face of considerable mounting pressures. How the flood of 2009 influenced this resilience is discussed below from an SLA perspective; however, as these are closely intertwined, they are not separated out in this section.

Regardless of the accumulating challenges, farmers have managed the fells for generations, through the use of a sophisticated flock/herding system, which utilises pasture and grazing at different altitudes dependent on time of year:

> "…what people don't seem to understand, the sheep go on the fells and do a good job out there but the only way they can survive and keep healthy is when they do come in to the in-bye land, they could get a good change of grass. I've always said it's just their caviar, **the valley floor's their caviar** and that sort of gives them a boost and the 3 or 4 times a year they're down here that gives them the boost and the goodness to survive on the poorer ground the rest of the time." C34_M_4 (emphasis added)

In a series of floods that culminated in 2009 large areas of this “caviar” pasture land in the upper catchment were repeatedly covered in gravel and sediment, often several feet thick, which meant that this valuable ‘natural’ resource was threatened. Farmers along the course of the Derwent found that in order to restore this prime ‘in-bye’ land to a condition suitable for grazing and fodder production (i.e. hay/silage mowers could not be used on stone-covered land) they needed to either pay someone to remove the gravel, or they needed to do it themselves.

Key organisations did use the opportunity to try to encourage farmers to let the affected pasture ‘go back to nature’, because of the cost of remediation but also the fact that this re-naturalisation would comply with certain water-quality related targets and could be integrated within a farm’s inclusion into a High-Level Stewardship (HLS) arrangement (Natural England, 2013). However, the strong emotional attachment that farmers have with their land meant that instead of thinking about adapting their fields to new land-management methods:

> “…[they] put their hands in their own pockets and paid to restore them … because that feels part of their farming system. It might only be a little percentage, but it’s part of their farming system which they need, it could be silage field, could be a field they put sheep before they lamb, whatever it might be, and it needs to be put back.” (C05_F_1)

Land value was not, however, purely determined by its agricultural quality. Much of the affected land had what could be termed as natural-capital value because it lay within designated Special Areas of Conservation (SAC) and some of the river reaches had themselves been declared as Sites of Special Scientific Interest (SSSI). This resulted in conflict between some different individuals’ and organisations’ perspectives, with the difference of opinion revolving around understanding what sediment deposition should be understood as in terms of land management:

> “Let’s say you have a wetland SSSI its designated for its botanical interest and then a flood comes and causes some damage to that SSSI then if that wetland is in a flood plain then the floodplain will be seen as an active process and whatever impact that has on botanic diversity it’s just one of those things” C55_M_1

The other perspective was that inundation and deposition represented a spoiling of a pristine environment, which needed to be rectified for the land to have its value returned:

> “…how do you restore a damaged SSSI? And it’s like a town, isn’t it, how you restore a damaged town? What’s more important, the access, people’s homes, the services, the water, the gas? And there is a procedure isn’t there? And somebody’s actually worked out what the priorities are. But for rural areas, or for the sort of the back woods, there’s nothing. And I’ve

> been very concerned about how you restore a damaged SSSI. Nobody knows and nobody wants to know." C15_M_3-3

With land and river management practices during flood recovery being so contested, an important factor in getting the countryside 'working' again was the presence of key communicators within the managing agencies. For example, one individual's noted skill was not only in explaining complex hydrological processes, but in doing so in a way that clearly managed farmers' expectations against what was achievable (in physical, economic and bureaucratic terms):

> "…he called a spade a spade because he wasn't scared of saying what the [organisation he worked for was] trying to achieve and trying to put to bed some of the myths about gravel. And he knew about gravel, the dynamics of rivers and it's a complex subject isn't it, trying best to put that across. And I have to say not everybody in agencies or representing agencies actually do that; I think that they're kind of a bit soft, you know, when you've got somebody who's a bit challenging on the other side." C02_M_1

Other individuals also proved themselves particularly important in terms of facilitating the local approach to river management that emerged as a result of the 2009 experience and which was facilitated by the funding that the rural experience of the floods attracted:

> "…it was also engaging people which is crucial in the short-term, that was [Ralph]'s tactic, I came to realise quite quickly. He's an astute man is [Ralph], I'd never heard of [Ralph] before at all and all of a sudden I came across him, and then he was everywhere" C02_M_1

In terms of the wider catchment there were some cases where the shortfall in direct aid to farmers necessitated significant financial outlay on new equipment for sediment removal or additional transportation costs, related to feeding stock that had been moved to more distant pasture; these costs being borne by the farmer.

The issue related to sediment deposition that caused particular tension between farmers and agencies was dredging. Although the Lake District National Park prides itself on its "spectacular landscape, its wildlife and cultural heritage" (LDNPA, 2006) it also recognises that today's landscape is the result of hundreds of years labour and adjustment by humans. This adjustment includes the historical channelisation of many of the region's rivers, including the Upper Derwent, by the Cistercian monks in the 12th century (Interviewee C07_M_1). The fact that channelisation and its related channel dredging has been going on for so long, was broadly recognised as introducing significant vulnerabilities to the agricultural land through which the rivers flow:

> "[This] engineering approach created a situation where here's your river bed and there's your flood plain you take the gravel out and you pile it on the bank with a machine[…], the next day

> you get another flood event, another pile of gravel appears on top and another and you keep piling it up on the side but what's actually happened now, in these places, is that the bottom of the river is now higher than the flood plain. Now what happens is you then take the diggers away and you stop digging this out so the next flood event that comes up, it overflows and it takes the gravel and it covers the flood plain with gravel." C55_M_1

The UK Government agencies' regulation of channel management and local stakeholders' capacities to influence these constraints were, therefore, the focus of considerable speculation and concern amongst project participants[11]. One interesting take on this issue was illustrated by the work of one particular social network; the Borrowdale Whole Valley Planning Group. This group, consisting a range of riparian owners, valley residents and agency representatives, was originally formed in 2010, in order to develop a sustainable management plan for the valley, which was experiencing the combination of increased flooding, bank erosion, and sediment accumulation, along with increased incidences of low flow (Maas, 2011). This group collaboration resulted in the development of a management plan that proposed managing sediment accumulation (through skimming and dredging) in nine 'hotspot' locations along the river system. This approach and the conclusions it reached were considered to be quite politically controversial by several participants:

> "…we almost ended up cutting across national policies. I mean the [Environment] Agency and Natural England, their floodplain connectivity is the objective, isn't it? We did the opposite; we took gravel out the beck." C02_M_1

However, as one involved expert pointed out, even though the Environment Agency no longer had a remit for long-term gravel management…

> "…it's not a credible position for an Authority in our position to say 'no, we're not going to [dredge], no, you can't. That's just an impasse, so what were the issues? […] if the farmer wants to remove the gravel and put his energy into doing that, then effectively he can and he's a riparian owner, he has a right to manage his banks and to maintain the river and allow water to pass freely though his land." C14_M_1 (emphasis added)

This apparent confusion over whether dredging was allowed and whose responsibility it was to dredge developed as an underlying theme in the work, which echoes throughout current flood-risk management discussions in England (EFRA, 2014). The Environment Agency

[11] Even during the fieldwork phase of this project, river dredging regained in political importance, as the move away from physical channel management was invoked as a contributory factor in the flooding that occurred across southern England during the winter of 2013/14.

policy[12] outlined by C14_M_1 could be considered as an illustration of the downward-shifting 'responsibilization' for environmental management discussed in section 4.3.1. The fact that such apparent shifting of control is set in a top-down bureaucratic context, which still seeks to constrain local-scale decision-making (e.g. through the consenting schemes), points to wider participation in flood risk governance but not necessarily to any changed degree of multi-level political control in that process (Walker et al., 2010):

> "We managed to get the money to [dredge] those areas as a one-off and the idea was once that big job had been done, the local people, i.e. the farmers in this instance, would go in, under constraint, under the rules governed by the Agency, and be able to do that themselves next time. […] Now that hasn't really worked yet, partly because the Group's gone into sleep mode, but also, it's a real problem working through the consent system. I know it inside out because I do it a lot but farmers just don't want to know. They don't want to fill in reams of consent forms and pay £50 and wait 6 weeks, it's just not their way of doing things." C02_M_1

The prohibitive nature of this level of bureaucracy is actually understood as problematic by Defra (Environment Agency, 2013b), but in terms of the Borrowdale work it still appeared to be having significant effects on the exposed community's capability to organise its own resilient response to this threat to hill-farming's resilience:

> "Now the sad thing is, the bits we've done already, if we don't go back and maintain those fairly soon, there's so much gravel in that system that we will go back to where we were before and that would be a bit of a shame really, given the effort's that gone into it so far." C02_M_1

The assistance offered by other national and local stakeholders to affected farmers operated in other ways too, initially by simply identifying who had been impacted and then employing a coordinator to direct these individuals toward grants and other recovery resources. Each affected farm was, for example, awarded a grant of £6,800 (€8,600) with which to carry out remedial work to rectify what was predominantly uninsurable damage (e.g. farm track repair) Support also included gravel removal advice but also assistance toward the one-off replacement of damaged watercourse fencing. The fencing issue was particularly interesting from a 'physical' resilience perspective because whilst fence replacement was strongly

[12] The Environment Agency is responsible for issuing consents for work conducted in Main Rivers, whereas Internal Drainage Boards and Lead Local Flood Authorities are responsible for authorising work on ordinary watercourses.

advocated in terms of assisting toward meeting EU water-quality standards, the widespread adoption of initially more expensive short-length, straight-wire fence construction, rather than standard “pig-netting” along high-risk sections of riverbank, has meant that future flood damage to this new fencing will be reduced (Interviewees, C05_F_1 and C16_M_3-3) (Plate 6.1). Whilst not all advice could provide such beneficial outcomes for the farmers, the advisor was held to have largely resolved or at least reduced the bulk of farmers’ financial, land management, and in some cases psychological and social, flood-related problems.

Plate 6.1: 'Flood resilient' Single strand fencing (Borrowdale) ©H Deeming 2014

Of course, farmers are not the only people who live in the rural parts of the catchment. The aging demographic of the county (section 4.2) is well illustrated by the propensity of newcomers (“Off-comers”) to retire into the villages and surrounding countryside. Evidence of tensions within this mixed rural community emerged in relation to perceptions that their wish for “peace and tranquillity” cut across the fact that for others this is a working landscape. Accordingly, whilst the attitudes of many off-comers were regarded with some ambivalence, even by fellow off-comers, there was one example of social/political dynamic, which included an element of flood within it that challenged simplistic ideas of a harmonious resilient rural community:

> “The Parish Council are making a road wider for [one farm] ‘cause the milk tanker goes up and there has been a little conflict because of it and the Parish Council have stepped in and

> they are going to move a wall just to help solve the difficulties and that…that's village life. They've all forgot about the farmer rescuing the bloody people out of the houses in the village on the night of the flood and now when he wants something done there's tittle tattle and friction but he was risking his bloody neck to get some people out of them houses on that night of the flood, funny how short memories are." C54_M_4

What this example makes clear is that despite there being evidence of conflict between traditional and newer residents the presence of formal governance structures, such as the parish council, does offer a forum for adjudication in disputes that threaten community values. Parish councils' capacities to act as linking assets between communities and the formal civil protection agencies will be discussed further in the next section.

6.2.2 Rural resilience: Community Emergency Planning

Two villages where interviews were conducted suffered significant impacts during the 2009 event. In Braithwaite, the Coledale Beck broke its banks and flooded around 32 houses in various hydrologically-exposed pockets. In Low Lorton, several homes situated near the River Cocker were inundated and the village bridge was dramatically washed away taking a local man and his tractor with it: luckily he survived. This community has also suffered additional flooding since 2009:

> "In fact since then, despite the fact that we're constantly told 'Oh, this is 1 in 100 year episode', we've actually had summer flooding, which has caught people out because they don't expect that kind of weather in the summer." C17_F_4

In both villages the community response to these flood events and to flood risk more generally was identifiable in the emergence or extension of highly localised risk management and emergency planning processes.

In Braithwaite and Lorton, the community response to the 2009 flood could be characterised as spontaneous emergence (Dynes, 2005a), which resulted from the fact that the magnitude of the event was such that formal responders were largely unavailable for deployment outside the locations experiencing the highest levels of *social* risk (i.e. the towns). Whilst understandable, this focused deployment of overstretched formal civil protection resources led to predictable but also pragmatic responses by those intent on protecting their communities:

> "…several people had phoned the council and tried to phone numbers where they thought they would get some assistance from local council or the government and they were told no chance you are on your own so hence we were just literally throwing pavement slabs up and all sorts of things to cause a barrier." C03_F_3-3

As well as heroic behaviour by individuals witnessing extreme examples of *individual* risk (Kasperson, 2005):

> P1 "[*Name*] went over the bridge
>
> P2 just before the bridge went in the water
>
> P1 just before it collapsed, in the tractor. To try and get people on the other side because it was terrible on the other side and they are used to flooding, they food if not every year, every other year their houses would flood but this was a lot worse than, the houses were going to go you see so it was that bad. And [name], one of our neighbours, on a tractor, he went over, he had the biggest tractor so he went over, he shouldn't have done." C54_M-F_4

The, not uncommon, realisation that they would always likely be 'on their own' (King, 2000) in a future event of similar magnitude catalysed a desire in some community members to develop a contingency planning process.

In Lorton this planning was facilitated by a local 3rd sector worker, mentioned above as a key-individual because he had also played an important role in the Borrowdale Whole Valley Planning initiative. The Lorton group were, in fact, a key 'early adopter' (Rogers, 2003) of the ACTion for Communities in Cumbria 10-step emergency planning process (ACT, 2012). Although the concept of emergency planning came largely from their experiences during the flood, the activity itself was an extension of a pre-existing community-planning forum, which had been convened, again with facilitation from ACT, to consider ways in which the Lorton and wider Melbreak communities could determine their own future (Melbreak Communities, 2011).

> "…2 years ago we achieved publication of our first Community Plan. One of the priorities for action which emerged from that Plan was to develop an Emergency Plan. […] There is definitely an appetite locally for the peace of mind that we believe comes with some sort of, albeit informal mechanism, which can respond in the event of flooding, or indeed other kinds of emergency." C17_F_4

The fact that the emergency planning 'task' was actioned as an extension of this community-planning group's interests was regarded as part of its strength. This was because there was less likelihood than with a single-issue group that members would get disillusioned and leave if no emergency occurred to test their preparedness (C32_M_3-1). The importance of the principle, of developing community capacities, as well as more focussed sustainable civil protection processes, by integrating them with existing institutional structures, is well understood (Handmer and Dovers, 2007, Gilchrist, 2003, Kretzmann and McKnight, 1993).

In Braithwaite the planning process was truly emergent, with a small group convening in the aftermath of the flood to both plan for future events, but also to advocate for risk mitigation measures to be developed for the village and at the behest of the Parish Council, a wider administrative area known as the 'Derwent 7':

> "Now this meant according to [the National Flood Forum] that we were at that point [in time] the Flood Group with the biggest geographical area in the whole of the UK […]with the smallest population, the smallest physical group, the fewest members, the largest geographical area with the most diverse of problems" C03_F_3-3

Despite the scale of the challenge, the small flood group engaged with multiple stakeholder authorities and developed a sophisticated understanding of their local flood history. Their engagement led to works being carried out in the beck above the river (Plate 6.2), a stretch of which was itself categorised as 'main' river in order that the Environment Agency could take over responsibility for its management. These outcomes and the successful advocacy that enabled them, were made possible due to the skills, learning capacity and persistence of the group's membership. For example, one member's knowledge of contingency planning, which was gained during a related professional career, meant that his expertise provided a useful resource for the Parish Councillors to whom the concept was completely new:

> "I remember the Chairman of the Parish Council saying 'I haven't got a clue what this is all about, we haven't got any money, we haven't funds, we haven't got any resources' and all the rest of it. But now basically what they have been told to do is start planning, 'but what do we plan for?' you plan for resilience, you plan for emergencies. 'What emergences do we plan for?'" C61_M_1

Plate 6.2: Braithwaite Sediment Catch Pit (note fish ladder) ©H Deeming 2013

In relation to planning for rural-community response, 'You're on your own' was clearly acknowledged as not only being a concern in relation to this population's access to human CP resources (i.e. uniformed rescuers). The loss of, or closure of bridges for safety reasons, across the county after the event, led to severe transport disruption for rural dwellers as well as those in the towns. However, another factor that was identified as fundamental in terms of rural communities' resilience to hazards was the importance of robust communications infrastructure:

> "…there's one extraordinary assumption, doesn't really only relate to flooding, but is relevant, and that is that everybody assumes that in the event of a weather-related emergency, we're going to be able to pick up the phone and get help or inform people." C17_F_3-3

This communications-infrastructure issue is important, because if rural communities are expected to cope largely on their own during wide-area emergencies, then the focus turns to ensuring that those communities receive warnings at the earliest opportunity. Early warnings, supplied to people prepared to take 'effective action' to reduce their hazard exposure can mean the difference between communities conducting successful 'dry' evacuations and their need to be 'wet' rescued. Although social responses to early warnings is not straightforward (Grothmann and Reusswig, 2006, Handmer, 2000), the principle remains that timely and trustworthy warnings can extend the time available for individuals to deliberate, confirm and to effectively respond (Glantz, 2004). Avoiding the need for all

communities – but isolated communities particularly – rather than trained professionals, to conduct hazardous rescues is of paramount importance in terms of emergency management (Glantz, 2004, Mileti and Sorensen, 1990). Therefore, one commendable innovation within Cumbria Resilience Forum's approach to the 10-step Community Emergency Planning (CEP) initiative, is two-fold. 1) Police control room IT systems have recently been programmed to provide Control Room staff with the details of designated contacts in constituted CEP groups[13] in order that they can be engaged in responding to appropriate[14] dynamic incidents in their areas at the earliest opportunity. 2) Constituted CEP groups have also been recently granted access to the UK Met Office's 'Hazard Manager'[15] resource. This means that as well as having access to standard public warning services (e.g. the Environment Agency 'Floodline'[16] and river gauge telemetry[17]) these groups can now access some of the same dynamic weather risk assessments as the professional responding agencies. Notwithstanding the likely complexity surrounding how exactly communities will use Hazard Manager to inform their response choices (Handmer, 2000), the significant issue remains from the quote above, that rural areas need to have a sufficiently robust communications and IT infrastructure in place in order for them to have reliable access to such resources in the first place.

6.2.3 Rural community resilience: summary

Rural villages and outlying areas of the Derwent catchment have suffered a range of significant impacts from flood events over the last few years, of which the 2009 was only one. The rural 'community' that suffers these impacts can, however, be best understood as complex, with one obvious differentiation being that which exists between the traditional Cumbrian farming families and the increasingly prevalent 'off-comers'. In this context it may be helpful to consider the hill-farming community as a tightly bonded *community of identity*, which has persisted and sustained its practice largely only as a result its tenacity and

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[13] Statement by Assistant Chief Constable Steve Johnson (Cumbria Constabulary) at 'Building Resilience – Now and for the Future' conference, Penrith, Cumbria 9th Oct 2014

[14] It is assumed that what constitutes an appropriate incident for CEP group inclusion would be a subjective decision by the control room supervisor.

[15] http://www.metoffice.gov.uk/publicsector/hazardmanager

[16] https://fwd.environment-agency.gov.uk/app/olr/home

[17] http://www.gaugemap.co.uk/

capacity to adapt and diversify. In other words, hill farming has itself proven remarkably resilient in the face of multiple continued pressures, of which flooding is only one. However, a combination of the governmental downward-shifting of responsibility for flood management, whilst still maintaining a 'steering' role (Watson et al., 2009, Walker et al., 2010) and the chronic nature of farmers' flood exposure and vulnerability, means that in some locations farmers are actively engaging with the authorities in order to co-develop land and river management practices that offer benefits (or rather, fewer costs) to their traditional hill-farming business model. Whilst such forums have been deemed successful in achieving relatively innovative outcomes, the evidence suggests that their sustainability is dependent on the tenacity of certain "community champions" (C16_M_3-3) and other individuals, without whose leadership, interest and grass-roots engagement rapidly wanes (Cashman, 2009). Direct impacts of the 2009 event led to a mobilisation of financial and physical assistance to affected farmers, however, bureaucracies developed to manage the government priority of reconnecting rivers with their floodplains meant that remediation was not straightforward. How this farming community will maintain its resilience in a future that threatens more extreme floods is uncertain, but given the consequences of high-magnitude floods for the operation of in-bye pasture it seems that this additional pressure may push the industry toward a threshold beyond which the traditional farming culture may need to change significantly.

In the villages the mix of Cumbrian and off-comer is in places quite stark:

> "Q So you've lived here all your life?
>
> P1 39 years.
>
> Q How has the village changed?
>
> P1 Everybody's got older. Half the houses are empty. Not as many kids. What happens is people come here to die; they come here old, young semi-retired people 'cause they can afford to and then they don't make any noise or activities or, they just want peace and tranquillity." C54_M_4

However, the skills and resources of many of these 'immigrants' have been shown to affect local resilience, by driving local governance processes as well as by introducing new skills and attitudes into a traditional setting. The realisation that rural areas will be largely left to their own devices in any extreme flood (as has been the experience in both 2005 and 2009), has also driven an active engagement with local-scale emergency planning that has been encouraged by the formal responder agencies.

Cumbria Resilience Forum has also been proactive in the integration of rural community groups into local warning and informing networks. This should be regarded positively, but the limitations of communications infrastructure resilience (especially mobile and broadband) in rural areas should be acknowledged as potentially key constraints (Tapsell et al., 2005).

Having examined the rural context, the next section looks at the more populous areas along the Derwent and investigates how these more urban communities exhibit their resilience to flood hazard.

6.3 Urban Resilience

6.3.1 Keswick

Keswick is the first settlement of notable size along the River Derwent. The town is situated beside Derwentwater, where the so named river outflows before its confluence with the River Greta. This proximity to two rivers and its low relative topography meant that parts of the town suffered severe flood impacts to residential and commercial properties during the floods of both 2005 (198 buildings) and 2009 (300 buildings). The earlier 2005 flood experience in the town and the community's proactive responses to that event did, however, play a significant role in shaping its response to the 2009 event:

> "So we were galvanised and we were prepared and the community was engaged and we had a difficult job to do but it was a damn sight easier than it could have been because the work that the Flood Action Group had done made the town very flood-aware. And the work that the Environment Agency, [Laurie T] had done in setting up the Flood Action Group and the publicity that they've had locally, you know we're a community of only about 5,000, but when someone knocked on the door, whether it was a volunteer, Police Office, Fire-fighter, Mountain Rescuer and said 'you're house is going to flood'; when they got their text message alert, they'd be all signed up for it, they were very, very flood-aware, the community, so a lot of property, moveable property was secured and was saved." C13_M_1

Formed following the 2005 event, Keswick Flood Action Group (KFAG) had been proactive in engaging with Cumbria Resilience Forum partners in developing risk mitigation solutions for the town. The emergency planning and the emergency coordination that was undertaken by KFAG had, for example, resulted in a dedicated emergency-coordination phone line being wired into the Town Hall the day before the flood (C04_M-3-3). This in turn allowed the evacuation and rescue activity on the day and the recovery work afterward to be led from this room. Having evolved as a result of these experiences, the Community Emergency Plan (CEP) for Keswick is now sophisticated in detail and encompasses numerous specific preparedness and response actions to be taken chronologically by community volunteers,

from the initial receipt, local assessment and sharing of formal and informal severe weather warnings, through the monitoring of river-level thresholds, to the point where volunteers need to retreat from predictable flood areas before they are inundated.

One important aspect of KFAGs response function is that, from inception, its membership has been split between members whose homes are hazard exposed and those that are not. This is an important segregation, because it means that in the event of a flood the group members who do not need to be concerned about their homes flooding can give their undivided support to the residents who are at risk:

> "…the morning after 2005 we went round, essentially we had a walk round to see how high the lake was and realised how bad the problem would be, we called in to see [Catherine] and her husband] who are friends of ours and realised that they needed help with things like lifting carpets, and during the course of the day I think we lifted them for about 4 or 5 people; put a posse together and went round. And it was after that my wife said well what you need is people from outside who can come in and help before and afterwards. So that was the genesis." C04_M_3-3

However, KFAG has never been simply associated with preparedness and response. The Group's executive committee has always "*given unwavering commitment to try to do the best to reduce flood risk for the future of the community*" (KFAG, 2012: p.1) and whilst having the split group structure has been shown as extremely useful in terms of its flood response, it is apparent that there will always remain a difference between how the flood affected and unaffected perceive flood risk, even within the group, let alone in the wider town population:

> "I mean a lot of things you can't teach; it's like with the flood volunteers; it's great that they are volunteers and want to go out but they don't really understand how nervous people get way before it gets to the tipping point and I mean they are quite relaxed about it, thank God, they're all OK about it, but there's people like us going like 'Arghh the river's coming up'. So you can't, there's no way that you can put that experience on somebody else's shoulder's and them understand it, it just doesn't work. And no words describe how it feels." C15_F_3-3

Regarding this strong and prior-research corroborating evidence that affected communities' will bear impacts on their psychological well-being (Fordham and Ketteridge, 1995, Tapsell and Tunstall, 2008, Whittle et al., 2010), the 'Cumbria Resilience' community of practice also includes other 3rd sector organisations whose role is concerned with promoting well-being. One of these organisations is 'Churches Together in Cumbria' (CTiC). After the flood, CTiC was responsible for setting in place one of the most popular and practical resources in Keswick, St Herbert's Flood Support Centre, or simply 'the Soup Kitchen'. This facility,

which was staffed by church volunteers, provided a social hub for affected residents, where they could talk or do practical things like charge mobile phones or network in other ways:

> "…we referred to the soup kitchen which was just down the road, I mean the soup was dreadful (laughs) we only had it once, but as a meeting place, go round and talk, sit at tables and talk to people, 'what are you doing and who?' somebody said to me 'oh there's somebody really good in Carlisle, I'm having him down to advise on a pump', I immediately said 'right give me his name and phone number' that was the information" C18_F_3-3

The social-hub concept was not unique in the town, with CTiC and other organisations setting up similar facilities across the county (e.g. Christchurch in Cockermouth). The location of the kitchen close to the flood-impact epicentre was important too, because it meant that volunteers were able to host themed meetings (e.g. about insurance issues) as well as to provide a form of intelligence service for those affected, but also for the authorities who needed to be aware of any social vulnerability issues. This type of role fitted well with the local church ethos that had already led CTiC to develop contingency plans as a response to its own involvement in a number of emergencies across the county, from the 2001 Foot and Mouth disease outbreak, to the repeated flooding, to a fatal coach crash and the Derrick Bird shooting murders (CTiC, 2014); dealing with all of which had required a practical and sensitive approach from this locally trusted and respected community institution (C37_F_1).

In terms of other actions, related to flood recovery and risk mitigation, the focus of much KFAG activity since its inception has been in advocating for structural and non-structural flood defence measures. In order to do this, the group members have engaged fully with and developed effective working relations with the formal flood-risk management agencies and other water management institutions. Their committee seat on the multi-agency Keswick Flood Recovery Group (KFRG) and founding affiliation with the Northern Flood Action Group (NFAG) have injected an element of political pressure to their negotiating capacity at up to national scale. From its inception this capacity has included the negotiations in the aftermath of the 2005 event that resulted in the town being awarded a £6.1 million grant to build a flood defence scheme on the River Greta. This came too late for the properties re-flooded in 2009, but it was completed in 2012. Other areas of the town, however, were still vulnerable to surface water flooding and KFAG campaigned for funding and support in order to develop surface-water pumping options for these areas too. After years of negotiation over pumping capacities, responsibilities and funding KFAG formally accepted delivery of two mobile pumps on behalf of the town in July 2014 (Plate 6.3). The fact that one of these pumps is to be permanently stationed in a section of the town that has already undergone

significant drainage improvements would suggest, however, that the exposure and vulnerability of the housing in that area remains a cause for concern until a new underground pump solution is installed in 2015 (pers comm, C15_F_3-3).

Plate 6.3: The handover of surface-water pumps to KFAG ©S Taylor 2014

The fact that participation in these negotiations has itself greatly increased the expertise within this advocacy group (Tesh, 1999) has undoubtedly led to some positive outcomes for this community as it has for the other catchment communities with flood action or advocacy groups. However, the fact that FAG members inevitably assimilated a great deal of quite technical knowledge and were therefore able to question the agencies with whom they were dealing, sometimes led to frustrations. This point is best illustrated by a KFAG member who provided a detailed account of her frustration in trying to understand Defra's flood defence funding system (see section 4.3.1):

> "…one of the problems that we've got this flood development grant in aid is if you do the attenuation thing it's supposed to protect 76 properties, if you do pumping because its only around [named] Road it only protects 15 so that's not very many. If you do the attenuation and you don't do it with pumping then the pumping people are never going to get any help because it will come into double counting of benefits. So the only way that we can get an adequate financial solution for the town that might be affordable is to get both done at once. On their figures, in both reports they sent us, it's more feasible to do both because they don't have to raise so much locally, but they just don't want to do it. And when you've got these figures that say for flood development grant in aid for attenuation its protecting 76 properties, pumping is 15, which is the same but it would be with that 76 'cause the attenuation would help the 15 that are and then it says to do both schemes it only protects 48 properties, now how can that be? That just doesn't make sense does it?" C15_F_3-3

As with gravel management upstream, however, these issues relating to the actual practical management of flooding also revealed a divergence between the apparent aspiration

projected by European and UK civil protection rhetoric, of wishing to hand over more responsibility to communities to manage their own risk (Steinführer et al., 2010) and the policy environment that made such aspirations impossible to realise, at least from the perspective of the actual exposed-communities:

> "It gets me furious because [Council Emergency Planning Officer] used to stand up in front of everybody and give these talks about resilience and say 'how many ambulances are on duty in Cumbria?' and you'd have to guess and 'how many police?' and all the rest of it ; 'therefore you have to look after yourself'. Then we've got [Name FAG member] down [the] road who wants to hire a pump to pump water into the river and away from his property. Can he do it? Oh no! Because of health and safety. You can't open a drain, you can't have a pump, you can't do this, you can't do that, 'who's goings to insure it?' 'If we help you by refunding you the money are we going to be responsible for it?' People actually in this community cannot do anything for themselves because health and safety gets in the way and all the rules and regulations. You just can't do a thing, and I don't know how you can square telling somebody as a community that if Cumbria is hit every community will have to survive on its own." C15_F_3-3

Whilst the physical safety of community members is obviously a concern, the fact these new surface-water pumping measures will, by agreement with KFAG, still need to be operated by formal responder staff, does introduce an element of risk in terms of whether these staff resources will actually be available in the event of another high-magnitude event striking the town. However, it also reemphasises the point made previously, that if the operation of the albeit improved non-structural measures in the town remains the responsibility of county-scale agencies and their finite staff, rather than of the residents themselves, then the 'you're on your own' principle will continue to apply across the rural population; as staff who might otherwise have been able to respond beyond high-population centres are still retained to operate town-based measures.

As in the rural areas, Keswick's hard-won community resilience against flooding could be said to be underpinned by a number of key individuals. Most prominent amongst those would be the members of KFAG, who have lobbied so strongly for risk mitigation interventions (Box 6.1 uses social network mapping to illustrate the social connectedness of two principal KFAG members). For the reasons pointed out above, however, those group members directly affected by the flooding in the town have also been the strongest advocates for structural measures and for continued engagement and risk management. This is hardly surprising, because it is these individuals who would bear the direct consequences of another flood. However, this does not mean that these individuals are not fully aware of the limitations of flood walls and pumps. On the contrary, as Lane et al. (2011)

have previously observed, such individuals‘ risk perceptions and expectations can be founded on a sophisticated understanding of hydrological principles:

> “I think the thing that I learnt from that last flood is that we need to be much more alert and proactive all the time and forever and you can’t rest on your laurels ‘cause we just don’t know what that river defence is going to do. I personally because I’m very negative, I’m nowhere near a Pollyanna I personally can’t see how it’s going to work because I think if you, I mean we had 40 centimetres of water in this house, I mean it was up to my knees and if you fold all that water from that back hill up to the river wall now and plonk it in the river how’s it going to get through that bridge?” C15_F_3-3

The implication of this quote is that this particular person fully understands the standard of protection limitations of the town‘s £6.1M structural defence scheme (Plate 6.4) and, accordingly, that she remains exposed to considerable residual risk.

Plate 6.4: Keswick Flood Wall © M Fordham 2012

This on-going exposure to residual risk brings us to the need to consider issues other than formal civil-protection related actions. It is well known that flood-affected communities do not face any period of recovery in the same way that they face an emerging hazard event. Recovery, is a much more individualising experience, where the flood affected are required to negotiate their way back to “maintaining their essential function, identity and structure“ by engaging with new sectors and actors and for some this experience was remembered as “worse than the actual event“ (C04_M_3-3). This ‘recovery gap‘ “emerges during the longer process of recovery at the point where the legally-defined contingency arrangements provided to the affected community by its local authorities diminish and where the less well-defined services provided by the private sector (e.g. insurance, building industry) start.“ (Whittle et al., 2010: p.120). Experiences of the recovery gap were varied in Keswick and sometimes surprisingly so.

Box 6.1: Social Network Analysis of Keswick Community Members

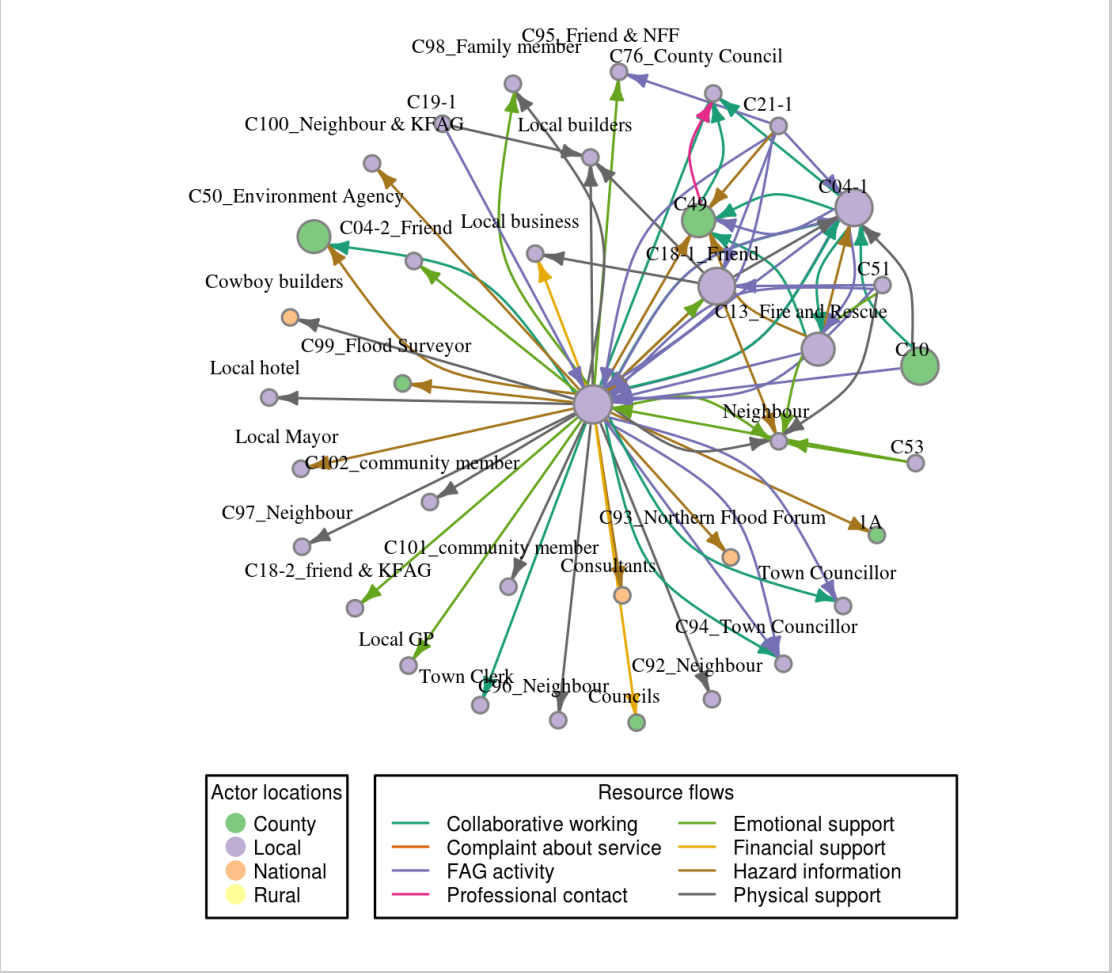


Figure 1: Social network map of central female (C15) in Keswick

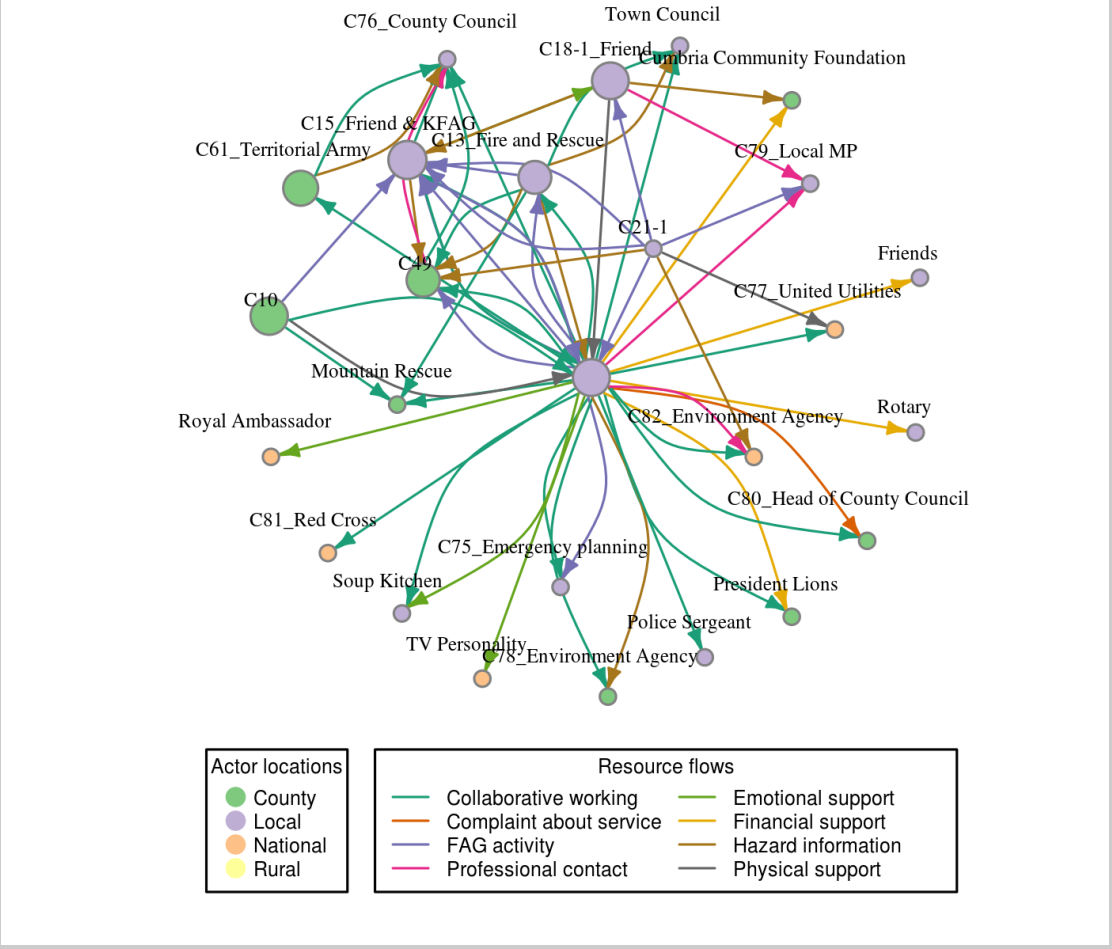


Figure 2: Social network map of central male (C04) in Keswick.

Figures 1 and 2 above represent social network maps for prominent female (C15) and male (C04) community members, as identified by high betweeness centrality scores in the research sample[18]. Both individuals are based in Keswick and are, or have been, active members of the Keswick Flood Action Group. The maps show that these actors are directly and indirectly connected to a range of individuals and organisations across a range of sectors, including: government, emergency services, environment agency, private businesses, insurance companies and third sector groups. The maps show that these individuals are part of a diverse social network and are on first name terms with many of their network links (as denoted by the number of connections with individual actors coded with the

[18] Centrality was measured using a betweeness centrality measure (see section 5.7 on methods). Individuals that achieved scores above 500 were considered to have high centrality. These two individuals received centrality scores that ranked in the top five highest scores in the overall sample, with scores of 1153 (C15) and 780 (C04).

prefix C). These diverse network structures enable the provision of a range of resources (as shown by the different colour arrows) including: emotional, physical and financial support, to build resilience to flooding. The individual networks also show strong collaborations and professional contacts, particularly with the governance sector, which helps with the acquisition of local and national flood information and promotes the activity of the Flood Action Group in government circles.

The maps suggest that the broad networks of the two individuals contribute to the successful reputation and good work undertaken by the Keswick Flood Action Group. Bringing together these well connected individuals in the form of a community flood action group enables for a concentration of social capital by combining the two social networks and this provides a powerful socio-political resource to the community. The availability of a broad and diverse set of network connections enables the group to target its resources to flood advocacy and response more effectively. The human capital possessed by these individuals in the form of flood awareness and education, enhanced through their networks, fosters expertise and skills that help them to undertake community activities and represent the Flood Action Group. The strong third sector presence is enhanced through bridging associations with other community groups (e.g. Rotary, Lions and Red Cross) as well as the Environment Agency, local government and emergency services. This broadens the network's reach and strengthens the ability to draw in wider resources from outside the community.

Figure 1 shows that physical support is mostly sought from local builders but also through neighbours who provide valuable advice and support regarding their own experiences with building companies. In figure 1 emotional support is mostly drawn from friends and neighbours and fellow Keswick Flood Action Group members as well as from the local GP. In figure 2 the local church run soup kitchen support centre was the main source of emotional support following the flood. Although the sample is not representative, it is interesting to note this finding that the female actor mainly relied upon friends and neighbours for emotional support following the flood, whereas the male relied upon the local church soup kitchen. The male also has more connections that perform an emergency services response role. Both individuals are able to draw in socio-political capital and information about flooding through their connections with key regionally based Environment Agency staff (e.g. C49, C50, C78 & C82). These key connections with the Environment Agency regional staff enable increased engagement and collaboration to take place in Keswick, which fosters a deeper understanding of the hydrological factors underpinning local flood events as well as government policy and investment in relation to flooding. Such collaborations enable more informed and targeted flood advocacy for flood defences in Keswick.

The Environment Agency actors, as well as fellow Keswick Flood Action Group members, constitute central actors within the network (as denoted by the larger dots and surrounding network clusters) and these represent important sub-networks, which the individuals can harness as part of their wider social network. Hence connections generate additional connections (e.g. in figure 1 a connection to a professional contact is generated through an indirect connection to C49). Socio-political capital is drawn in through linking with influential politicians as shown by connections with the local Mayor, local

MP and local Councillors and bridging with local and regional government officials. These linked connections, in addition to connections to TV broadcasters and Royal affiliations, have been important for generating an increased public profile for Keswick and its flood risk problems, which has possibly helped in successfully pulling financial resources through government and community-based grants or donations.

Negative exchanges between networks were identified through the resource category 'complaint about service'. There are limited occurrences of these in the above social network maps. The negative exchanges between networks tended to be more widely identified by residents in Workington who were not as well connected as the participants interviewed in Keswick, despite some being affiliated to the town's flood action group. This demonstrates that communities require a range of resources to assist in building resilience to flooding and social networks play a key role in this. The presence of strong human capital inhered within well-connected community members fosters actively engaged community groups and third sector presence (e.g. formally constituted Flood Action Groups), which helps to build good collective social and political capital in a community. This diversity and concentration of social networks in Keswick contributes to the community's effective mobilisation of a range of resources including: emotional, physical and financial as well as the ability to acquire up-to-date information on flooding and professional links. These elements amalgamate to strengtn the ability of the Keswick Flood Action group to successfully lobby for local flood defences and other forms of support on behalf of the local community of Keswick.

For many this process proceeded efficiently. However for others, these negotiations left householders and businesses (NB. some participants operate businesses out of their homes) stressed, frustrated and unhappy with the service they received. Even individuals who thought they had learned from previous poor experiences and who had changed their negotiation 'tactics' accordingly, felt let down:

> "The first time we were out of the house for 51 weeks altogether, we were closed for 51 weeks. And we had a builder from Manchester and he would just come one day and he'd say 'see you tomorrow' and then we wouldn't see him for 3 weeks. So this last time we had a local builder, he was somebody that used to be a neighbour I used to be with his wife, his cousin worked for the family firm mates with [my husband], we thought it was all going to be alright. It was awful." C15_F_3-3

The time these restorations took to complete also impacted in other ways, with household routines disrupted not only by the need to project manage the restoration of damaged properties, but to do so whilst also being forced to move from one ephemeral temporary accommodation to another:

P2 - There was one family who lived behind us in [road] and they were in something like 11 different properties in 3 months. They were like a week here, fortnight there, 10 days there

P1 - but that wasn't to do with insurance, it was just because they couldn't find them anywhere to stay.

P2 - and because their jobs were in the supermarket here and they were being put out at places like Carlisle and it was

P1 - the strain on them must have been just

P2 - *the strain on them was just staggering*. C18 (1-2)_F-M_3-3

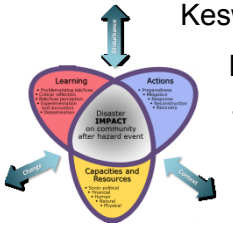
As with the engagement with the risk mitigation work, however, some individuals had sufficient resources that they were able to contest what they perceived as poor service and use their skills, knowledge and persistence to negotiate better deals for themselves:

> After a couple of days the doorbell rang and there was this woman with 3 men in tow. 'I'm from the insurance company, this is my surveyor, and these are 2 people' whose names I don't remember, 'they're builders and they can start clearing tomorrow'. She marched in with a clipboard and said 'right, we'll want to strip out the plaster to a metre high, we'll have all the floorboards up, you'll be moved out for 6 months, blah, blah'. I said, 'no, we won't'. […] And in the end I said to this woman 'go away, we'll dry ourselves out'. Because we have a different insurance company for the building and the contents for historical reasons, this was the buildings' lot. 'We'll dry ourselves out. I don't want big industrial dryers which dry everything and will crack the wood. I want it done gently with lots of air and we'll do it, on the understanding that we can come back in a couple of months and assess what we need to claim on the insurance and what we want done through you then, when we've dried it out slowly'. So off she went with bad grace" C21_1_3-3

These individuals, however, still suffered in the face of the complex and frustrating bureaucracy involved in recovery, but one key attribute was their ability to prioritise and to operate at a threshold, where they were able to get through each day with tasks completed:

> "I mean it was awful. How you actually deal with young children that are distressed and all the rest of it and go to work and meet builders, meet loss adjusters, meet the insurance company, deal with the never ending paper work it just took our lives over. And like we were saying last week we used to end up thinking OK I want to do this job today so you have this frog list, which is to eat a frog a day, the frog job was, you know and it might just be phone up and arrange an appointment for such a such but if I did that I'd achieved what I needed to do that day and I couldn't do anything else and that was without having a life really, the way it would normally be. I mean I do another part time job as well." C15_F_3-3

Keswick: Summary



Keswick is regarded within the Cumbria 'community of resilience practice' as a beacon in terms of the way that flood risk mitigation has been taken into the heart of the hazard exposed population. Prior experience of significant flooding had created the impetus for residents and local businesses to unite under the umbrella of the constituted Keswick Flood Action Group. As a result of this socio-political network and the knowledge and learned FRM expertise inhered within KFAG, preparedness and response actions during the 2009 event are widely acknowledged to have lessened the consequences of the flood for many residents. However, response capacity is only part of the story of Keswick's flood resilience. The fact that KFAG and key individuals within it have integrated themselves effectively into the 'Cumbria Resilience' community, has also meant that key relationships have been developed to enable an effective (if often frustrating) co-development of physical mitigation measures. Principal amongst these is the £6.1M structural scheme. However, other key 'victories' have included the purchase of surface-water pumps as well as collaboration in the planning for major drainage works. In terms of recovery, this more individualised and negotiated process has been borne by many households with stoic determination: despite evidence of learning from prior errors some people still had to contend with harsh experiences caused by others' inefficiencies. Social networking and the thoughtful provision of social hub facilities, where 'floodees'[19] could meet and let off steam by sharing their stories did, however, provide many with some of the vital support they needed during the protracted weeks and months of insecurity.

6.3.2 Cockermouth

Cockermouth is situated at the confluence of the River Derwent and the River Cocker. As with Keswick, this position makes the town vulnerable to flooding from either of the rivers or from a combination of the two. Accordingly, the lower-lying areas of the town have a long history of flooding and in recent years one area, The Gote, has been subjected to three separate flood inundations culminating in the 2009 event. The flow confluence that occurred in 2009, however, was on a different magnitude than these earlier events (and historically unprecedented), with depths in the vicinity of Main Street reaching 2.44m (Plate 6.5) and

[19] 'Floodee' was a phrase coined in Keswick to describe those who had been flooded. It was regarded as preferable and more empowering than the often applied terms, flood 'victim' or flood 'survivor'

with ~200 people needing rescue in a highly dynamic multi-agency operation that became the focus of national media attention (Environment Agency, 2010).

Plate 6.5: 2009 flood maximum depth (2.44m) marker board in Cockermouth ©M Fordham 2012

Due to its history, there was a great deal of accumulated experience of flooding in the town prior to the 2009 event, but what contributed most to the response to this event was that the entire, largely independently owned commercial centre had been inundated as well as the more chronically exposed areas. This impact on the heart of the town precipitated concerted recovery-focussed activity from the local businesses:

> "I think because independent business traders are by nature used to being relatively decisive and relatively used to taking charge of their own future, as it were, that's, if we weren't that sort of people we wouldn't be in this sort of business. So you have a core initially of people who immediately understood that we'd got to organise, get something done and that talk wasn't enough and we had to have actions" C06_M_4

What followed was a drive by a newly invigorated Chamber of Trade[20] (CCoT) to use the event as "an opportunity" (C28_M_4). This leadership was illustrated by a decision on the part of the CCoT to actively project the message "Cockermouth is Open for Business":

> "That was the thing that we really grasped on straight away and that we also realised that there's no mileage in, that the news media want to come and have the tearful, on the streets 'my life is in ruins' and we wanted to give out the message, 'OK, it's been bad but we're already doing something about it'. Partly because the nature of the community and the Cumbrians, but also because it was important because it's a trading town, it's a trading town, and we knew that if people got into the habit of shopping elsewhere, we might never win them back." C06_M_4

Many of the affected businesses moved as 'pop-up' shops to a local auction rooms where they had space to trade, away from the disruptive restoration that was happening in the Main Street. As well as the CCoT, the Local Authority also supported a business liaison officer who was able to "cut through the crap and bang heads together" (Chippendale, quoted in: Brignall, 2014). Viewing the recovery as an 'opportunity' also allowed businesses to regenerate their premises (in strict accordance with building regulations) so that what re-emerged over the next months and years was regarded as an improvement over what had been there before:

> "You wouldn't choose to do it, but how often do you get a chance to completely rebuild a high street […] hopefully we are proof that you can bounce back. But if you just wait for something to happen, it won't" (Chippendale, quoted in: Brignall, 2014).

The experiences across the commercial sector in Cockermouth were not, however, universally positive. Fieldwork identified elements of dichotomy in relation to how different proprietors had weathered the impacts of the flood on their small businesses. Box 6.2 presents an extract from Deeming et al. (in press) that discusses two such businesses, in a way that illustrates that even though the commercial centre of the town has visibly recovered and 'bounced forward' from some perspectives, the actual experience of recovery that has been lived by some business proprietors has been markedly different. Both these businesses proved themselves 'resilient' in that they re-opened and continue to trade. However, the differences in personal experience that underpin these two individuals' recovery trajectories raise an important issue for measuring resilience over time. This is that recovery to 'an acceptable level of functioning' can be largely subjective in interpretation. A

[20] The town's Chamber of Trade prior to the flood had been described as "moribund"

more important question to focus on would therefore be to investigate whether individuals' and community recovery experiences indicate whether these entities could replicate a similar 'recovery' again, or whether experience of another similar or lesser magnitude hazard would push them across a threshold into unsustainability. From this perspective the idea of resilience as an indicator of a system of interest's capacity to thrive (rather than to simply survive) should become greater interest (Arnold, pers comm: cited in emBRACE, 2013)

Box 6.2: Comparison of the resource and capacity differentials of two small businesses affected by the 2009 flood in Cockermouth, Cumbria

This comparison utilises the Sustainable Livelihoods framework to identify qualitative resource/capacity differentials. It was developed from data collected during emBRACE field-based research and was first reported in Deeming et al. (Forthcoming). For confidentiality reasons the two small businesses interviewed are represented as Small Business 'a' (SBa) and Small Business 'b' (SBb).

Resource Sets	SBa (Small Business 'a')	SBb (Small Business 'b')
Human Resources	Skills in technology, financial accounting; knowledge of possibility of opportunities; effective social skills for business; self-image as shy but capable	Older owner; health issues; limited knowledge and skills related to technology; limited social skills for business; self-image as embattled
Social and Political Resources	Business as family concern; well-connected and networked; active and productive participation in trade bodies and community at large;	Isolated, without visible family support for business; poor experience with trade bodies (led to cancelled membership);
Financial Resources	Availability of savings and credit; effective insurance; ownership of premises; financially productive use of post-flood services (e.g. temporary trading space);	Low capital resources; ineffective insurance (unresolved and unresolvable claims); rented premises; financially unproductive use of post-flood services (e.g. temporary trading space);
Natural/Place-based Resources	Flood defences overtopped in extreme event; business has firm attachment to place; capitalises on river and cultural-historic location; effective use of post-flood services (e.g. temporary trading space);	Flood defences overtopped in extreme event; limited business attachment to place; ineffective use of post-flood services (e.g. temporary trading space);
Physical Resources	Historic building close to river limits resilience measures but many building alterations made for improve resilience; lives outside the town but access soon reinstated;	Rejected original flooded premises (on safety grounds) and moved to alternative location; safer (on higher ground) but less good for footfall; lives outside the town but access was soon reinstated;

"These are both local small business owners, sharing the availability of place-based resources (e.g. flood defences (overtopped in this event), disaster response, municipal commitment to town recovery and regeneration (including provision of services such as skips, etc.), charity and volunteer aid to the town). Both were hit badly by the floods and both businesses continued to operate during and after the flood. However, they had a different trajectory of recovery and differing resilience outcomes, which preliminary analysis identified as being dependent upon a complex mix of factors touching upon a range of resource sets and capacities. SBa generally recovered well with an expanded business, incorporation of many resilience measures (bounce forward) and a recognised place within the community. SBb recovered less well, with a business of similar size (bounce back) and a reduced sense of wellbeing and community embeddedness.

The differences between the two businesses' recovery (and resilience status) are related strongly to the differences between the two business owners in terms of availability of economic capital, business acumen, social networks and individual psychology. In relation to one of our key components of resilience, social learning, these two small business owners had both benefited (albeit to differing degrees) from the social learning which had taken place in the town. However, other factors served to limit its effectiveness or application. For example, although they were both beneficiaries of community level information and knowledge regarding the hazard and appropriate adaptation measures, they were limited in their adaptive capacity, not by a failure to learn but by matters such as the externally imposed constraints on physical alteration of historic buildings; or the personal limitations imposed on preferred action through limited financial means." Deeming et al. (in press)

Concurrent with the efforts to restore the businesses and homes, there were clear demands for the authorities to reduce the risk of such an event occurring again. There followed an assessment of flood-risk management options, which looked at the relative benefits of a range of measures, from gravel management (dredging) (Brown, 2012) to catchment afforestation (ATKINS, 2012, Broadmeadow and Nesbit, 2010), to structural measures in the town. Ultimately, as had occurred in Keswick, the final decision was to concentrate resources on developing a structural flood-defence scheme, which included a state-of-the-art water-pressure operated flood barrier (Plate 6.6). After this assessment and planning process, which included considerable participation by the CCoT and Cockermouth Flood Action Group (CFAG), the finally agreed river-flood defence scheme was completed in 2014, with additional surface-water drainage infrastructure still being built at time of writing. What was relatively unique about this particular scheme was that, unlike the Keswick flood wall that was paid for in toto by Defra grant, Cockermouth's scheme came under the new partnership funding rules, whereby communities were required to pay a contribution themselves (see section 3.3) (Environment Agency, 2013a). With grass-roots leadership and advocacy from the local groups a precept – democratically-approved by the community – was applied to local council tax bills and 1% was added to business rates. This raised over £100,000 of the final £4.45M required. Other significant contributions, redirected from Council budgets and money collected from other fund-raising (e.g. the Cumbria Community Foundation), were also added to the £3.35M offered by the Environment Agency. Although the principal concern of the campaigning groups was to raise the town's standard of flood protection, the deliberations needed to agree the final scheme were always cognisant of the fact that protecting the town from a repeat of the ~1:500 event of 2009 would require fundamentally altering its physical characteristics. Accordingly, the pragmatic solution was

to achieve a standard of protection of between 1:75 and 1:100, with the residual risk being understood as mitigated by property-level protection measures, where these were appropriate, or covered by insurance:

> "We didn't build the walls to keep the water out so much as we built them to keep the insurance in" C28_M_4

Plate 6.6: Cockermouth automatic flood barrier © H Deeming 2014

Access to and the affordability of insurance was affected by the 2009 event, with reports of some flood-policy excesses being raised to unrealistic levels (e.g. £20,000: C51_M_4). This was occurring at a time when the whole issue of flood insurance in England was being negotiated between the Government and the insurance industry (Defra, 2013c). Given the commercial interests in the town, this issue raised specific concerns about what any failure

to incorporate small businesses into any sort of subsidised insurance would have for towns like Cockermouth. With its high percentage of independent retailers bearing a high commercial vulnerability to flooding, this issue was very pertinent; a concern that was generally echoed by national trade federations (FSB, 2013):

> "So small businesses will be in a pickle because the trouble is, you need flood insurance because in a lot of cases, if you are raising money you're using your stock as security and so obviously if you're a bank lending on stock, you want to know that that stock is insured against all reasonable risks. That's the problem." C06_M_4

Notwithstanding this concern from a particular sector in the town, there were a number of good experiences with locally-based insurance agents. However, there was always a concern that without a positive steer from government, this picture could change:

> "I've been making sure that my communications with [my insurers] at a more senior level have been maintained as I knew this was a problem. But they could turn round at any time and say, 'We're not going to give you flood insurance, because we're not required to anymore'." C06_M_4

In terms of household insurance, it is well understood that tenants represent a particularly vulnerable group, because they often cannot access or afford such protections (Burby et al., 2003, Priest et al., 2005). However, an interesting example of social welfare being reflected in a caring attitude toward tenants was evident in Cockermouth, and Keswick. Local Housing Association tenants reported high levels of care being offered and effective recovery management being exhibited by their non-profit private-sector landlords. This is a particularly interesting finding, because the actor with the greatest statutory responsibility for providing support for vulnerable households (of which some of those in social housing could be considered representative to some extent) is the Local Authority; a Category 1 responder. However, gradual change in the English social-housing sector has resulted in the vast majority of social housing in Cumbria now being supplied through these non-profit private-sector organisations, rather than as a local authority service. This well-regarded provision of service, therefore, illustrates another important aspect in relation to the private sector; that these organisations can learn. Two of the major local housing associations had had properties flooded in 2005 and this had directly resulted in their development of sophisticated contingency plans for future flooding. In terms of recovery this was particularly important, because this meant that when a number of their properties were inundated they were able to rapidly invoke the economies of scale in a way that private residents were not:

> "…because we are a big Housing Association, we work with [name] which is one of the biggest building contractors in Cumbria and we had an agreement with them, they used to do

> all our building works. […] they were able to do the same, more or less the same works, as the private lot, but for a far lot cheaper, as a unit cost." C27_M_1

This ability to work to a 'unit price' meant that housing association tenants tended to be out of their homes for a matter of 3 or 4 months, whereas the experience of private owner-occupiers and business owners tended to be that they were out of their properties for significantly longer than this[21]. Such a phenomenon, where at first glance social-housing tenants have fared better than home owners and others, has been previously observed (Whittle et al., 2010). However, as in that situation this should not be considered as being straightforward. For, whilst many owner occupiers went to considerable lengths to first negotiate and then incorporate 'resilient measures' into their properties' restoration (e.g. concrete floors, raised electrics, waterproof 'tanking' of walls), the housing association buildings were all replaced on a like-for-like basis. This meant restoration was expedited, but at least one Association was aware of the fact that in repairing like-for-like they were effectively reproducing exactly the same flood-vulnerable housing stock as they had before; i.e. they literally 'bounced back' to their pre-existing condition, rather than 'bouncing forward' (Manyena, 2011). This conscious decision was acknowledged through the understanding that if any floods affect these properties again, then it will likely push them over the threshold to unsustainability:

> "I found a big folder of all the works, all the costs of works and again, like I said, we did it on the cheap, didn't put in any flood resilience stuff at all, but there was a discussion being had that if it happened again, we would flatten and walk away and do something, we wouldn't refurbish again, potentially." C27_M_1

However, it also meant that housing association staff became active within FAGs and the wider community of practice negotiations and invested considerable effort in promoting and supporting FRM schemes that would protect their vulnerable clientele, as well as their investment interests.

As in Keswick, where the Soup Kitchen formed as a social hub of activity, so in Cockermouth where CTiC operated a refuge and information hub for the flood affected at Christ Church. This centre was staffed by church volunteers, but also served as a focal point through which local authority staff could coordinate their statutory duties of care (e.g. emergency housing provision). Working from this facility also ensured that these staff were able to coordinate

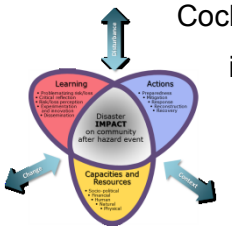
[21] As no private tenants were interviewed, in this case we cannot be sure of the general recovery experience of that group

the effective delivery of support to vulnerable households by 3rd sector partners who carried a local authority care remit (Riding, 2012). The volunteer activity coordinated by the local authority staff included the creation of a 'Street Angels" group who carried out visits to flood affected areas in order to provide moral support and to identify vulnerable people in need:

> "It is questionable whether these households, not already engaged with third sector support organisations or referred to mainstream support services, would have been picked up without the ceaseless work of volunteers from organisations such as Churches Together, British Red Cross, Rotary and Lions." Riding (2012: p.26)

The fact that other churches in the main street had been flood damaged, also meant that the churches' supporting activities were conducted from here on a cross-denominational basis (as per the CTiC emergency plan: CTiC, 2013).

Cockermouth: Summary



Cockermouth experienced a flood of unprecedented magnitude, which inundated the commercial centre of the town as well as more exposed areas. The fact that the heart of the town had been so badly damaged stimulated a powerful impetus to recover and reduce future risks. That the socio-political characteristics of the network of local residents and institutions that drew together to coordinate this activism had failed to materialise so effectively following earlier floods in smaller parts of the town could, however, be regarded as an issue of division, wherein spectators to the earlier floods may have felt sorry for those affected, but not so sorry as to have felt compelled into action. That the FAG was lead through this time by a resident who had seen her own home flooded three times in five years is testament to this individual's tenacity, particularly given that the combined impact of flooding and 'recovery gap' pressures can create intolerable pressures. As with Keswick, the focus of mitigation activity was on the building of physical structures, but there was always an understanding and fundamental trust that insurance would provide additional protection from residual risk. This trust was well-founded for some in the town who reported satisfaction with local insurance agents. However, for others concern is mounting that this financial-loss sharing mechanism will not always be available or that, already, it is unaffordable. Again this issue raises the question as to whether the 2009 has brought this community, or at least some individuals within it, to a threshold of unsustainability. Key learners in this town (and across Cumbria) were the private-sector housing associations, who had developed effective contingencies for supporting their vulnerable tenants. Local authority staff added another layer of social protection, through a previously unanticipated

need to identify, support and provide for impacted residents and their facilitation and coordination of the 3rd sector activity.

6.3.3 Workington

Workington is situated at the mouth of the River Derwent, where it flows into the Irish Sea. As such, this area was the last to be affected by the flood pulse as it flowed down the catchment. Without doubt the most significant impact to manifest in the town was the collapse of Northside Bridge and the resultant death of Police Constable Bill Barker; the only fatality directly attributed to the event (Cumbria Resilience, 2011).

The loss of this bridge and the damage to two others along this short river reach that led to their being condemned and closed, effectively sliced the town in two:

> "…if anybody had said 'let's have an emergency planning exercise the week before this happened and the scenario is that you lose 3 bridges in this town', you'd have been laughed out the room and I've lived in and around Workington for most of my life and I couldn't see that this was a place that was reliant on river crossings, like it was." C38_F_1

Almost overnight residents and businesses were faced with a one and a half hour detour, along a 14-18 mile round trip via Cockermouth, to get between parts of the town that sat facing on opposite sides of the river. Straight away the situation put pressure on the delivery of public services, e.g. with the need to develop ways to simply get people to their doctor or to the hospital. These challenges for road communication were to last for many months, although a temporary railway station was rapidly commissioned on the north side of the river[22] and the building of the "Barker Crossing" bridge by the Army (opened by 8th December), provided important pedestrian-only links between the divided communities. This considerable disruption affected residents' home and work lives, but the adaptations to their and to affected organisations' travel and transport routines were largely temporary and returned over a matter of weeks or months to pre-existing modes once the bridges reopened (Guiver, 2011). Plate 6.7 shows the newly built award-winning Northside Bridge which opened in October 2012.

The fact that the bridge failures garnered the highest levels of media, as well as local, attention at this end of the catchment should not, however, detract from the fact that 60-70 dwellings were also directly affected by flooding.

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[22] The industrial-era railway bridge was the only local crossing robust enough to survive the flood without damage.

[There was a] lot of media attention on Northside and the community centre up there. It's an area of social housing, deprivation, a lot of focus, media attention on 'Oh these poor people; these bridges washed away; they've got no access; they're cut off' and this sort. And I can remember one person in particular saying to me 'Why did they never turn the cameras round and look in the other direction to where we were, emptying houses, and throwing things away?' They didn't, they were focussed on the bridge, the infrastructure failure here." C38_F_1

Plate 6.7: Northside Bridge, Workington

As there was no river-flood warning system in place for the town at that time (Environment Agency, 2010), these residents had received little or no formal warning of the approaching flood pulse before it arrived "like a tsunami" (C59_M_4).

The enormity of the infrastructure damage also meant that the formal agencies, by their own admission, did not really engage with the needs of those directly affected on the floodplain for several days after the event. However, once these staff had developed a relationship with these households, these links of trust became central to these residents' recovery from the trauma of the event and their negotiation of the 'recovery gap':

> "P …one property had a tree trunk in the middle of it. This stuff had just come through with such force. And it's the little things you remember. I can remember going down to that particular person, it was an old gentleman, whose wife had died and he was with his daughter and he'd had a box with the china dinner service in that had been a wedding present 50 odd years ago and it had just gone and he was focussed on that, because it was his wife's pride and joy. And it's those kind of things that, we probably really didn't get plugged into that; we were so busy running around doing the practicalities.
>
> Q You needed a professional to actually be able to talk him through that?
>
> P Yeah, yeah but by the time we could offer that, they didn't want to talk to anybody else anymore; they wanted to talk to us, because we were there." C38_F_1

Such pressure placed on the staff of responding agencies was not unusual along the catchment. Contingency planning had simply not been done for an event of this magnitude or for the recovery from it, and over several days staff were regularly left to autonomously develop innovative solutions to problems they were faced with; not least the Police, who lost their local-communications capability when the recently built Public-Private Initiative (PFI) funded Police station was flooded:

> "…it was a genuine disaster to wake up and see your area on Sky news and think 'why have I not heard anything?' That's because there's no radio signals: the whole thing had gone down. To think that the police can't get hold of the police is an absolute, you know, and it literally was down to, it was kind of like a third world scenario, you know what do you do? So I got my pick-up truck and just drove to Maryport police station" C63_M_1

Once the flood had abated, recovery planning got underway, but where Flood Action Groups had formed a central focus in the other towns – providing a hub through which the authorities could engage with community needs – in Workington the situation was different. With such a small number of affected properties, relative to the large size of the town, the FAG attracted little support from the rest of the community:

> "So in Cockermouth and Keswick, where there were people who were involved with the groups, because it was about the community, and they weren't flooded, they still had an input.

> A lot of the people who were involved in Workington and drew that forward to start with, sort of burnt out a bit because by the time they'd been flooded and had to put all their houses back together, and they were doing this as well and there wasn't really anybody behind them, who didn't have all that other baggage to push it forward. And that's been difficult for them in that the wider community haven't come aboard with them." C38_F_1

So whilst individuals took a strong lead guiding the recovery and mitigation process in the other towns, they did so there from the position of strength that was provided by wider community support. Whereas in Workington, without this support, the efforts of the individuals, falling as they did alongside their own recovery stresses and 'recovery-gap' related re-traumatisations (Whittle et al, 2010), could become unsustainable on a personal level:

> P "…what happened was, in February, no because I still took time off then, so by summer 2011 I'd given up.
>
> Q Just so frustrated?
>
> P Yeah, and when they started about me like making an Emergency Plan to cover pandemic flu, you name it, and I thought, 'hang on a minute, you're getting paid to do this'." C57_F_4

The challenge for the formal agencies was also in trying to enable this community to become more self-reliant and capable in terms of managing their own flood risks, when the individuals involved were not able to 'buy-into' the idea:

> "[We've had] workshop days effectively on resilience planning and to be honest I still haven't got my head round it; I still don't understand what they are asking us to do." C27_M_3-3

These issues raise challenges for the organisations that wish to engage communities in deliberations over their sustainability and resilience. The evidence suggests that factors such as psychological pressure, frustration and physical and/or emotional exhaustion can mean that those individuals who emerge as key links between the community and the agencies are not necessarily able to engage with deterministic bureaucracies or to participate effectively through the whole course of the protracted negotiations that often exemplify such processes. Whilst building trust with communities is a key aspiration, for example, for the Environment Agency (Environment Agency, 2007), the fact is that trust in this context is more aligned with ideas of dependency than with feelings of mutuality (Szerszynski, 1999, Wynne, 1996), i.e. the flooded residents of Workington trusted – i.e. depended on – the authorities to protect them, but then felt let down. First when their homes were inundated with little warning and secondly when it became clear that there was no realistic chance that major investment would be made to protect their homes from future

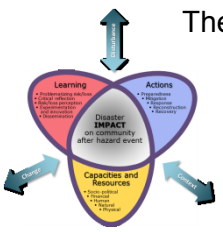
extreme events (i.e. the focus of the emergency planning process was – as in rural areas – more focussed on what residents would do in terms of preparedness/response, rather than on enabling of facilitating grass-roots advocacy for mitigation).

Workington: Summary

In terms of resources and capacities the central element of the Workington experience was the damage caused to the place-based infrastructure. The unanticipated failure of the town's bridges cleaved the town in two and placed enormous strain on a local authority that bore statutory responsibilities for service delivery in a community that comprised the highest concentration of deprived households in the catchment. The experience of the majority, however, masked the fact that a relatively small number of households had also suffered devastating physical impacts. These people were faced with the twin issues of disruption of normal road communications and also the recovery-gap negotiations. Some individuals have been engaged with the Cumbria Resilience drive to encourage community emergency planning. However, with only a tiny proportion of the town's population physically exposed to flooding this engagement has lacked the dynamic wider buy-in that the other towns FAGs have utilised so effectively in developing innovative structural defence solutions. The fact that the flood defence cost-benefit ratio will never favour significant expenditure on protecting so few households, set in such an exposed location, means that planning is effectively limited to defining the triggers for evacuation. The bridges have reopened and the rest of the town's population have returned to normal, whereas the resilience of these few depends to a greater extent on simply hoping that the flood will never happen again:

> "…we wonder, is it going to get us this time? And then you get to a point you think 'ah, it's never going to happen. It won't do. Look it hasn't happened tonight. Look, we didn't put the flood gates up; we didn't get flooded'." C56_F_4

6.4 Community Resilience: Summary



The county wide flood event of November 2009 impacted the Derwent catchment in Cumbria in multiple ways. Farmers were left deprived of their most productive land and village dwellers found themselves dealing with flood effects largely on their own. Simultaneously, town dwellers and small businesses suffered devastating damage to their homes and livelihoods as river levels overwhelmed built defences and inundated some commercial and residential areas to depths in excess of 2m. The majority of those affected have, however, maintained

or recovered a degree of functionality that could suggest this event was experienced by a population bearing high levels of resilience.

The natural-hazard governance context was shifting in Cumbria prior to this event. An earlier wide-area flood in 2005 had already exposed many in the county to high-consequence flood effects (Carroll et al., 2006, Cumbria County, 2005, Environment Agency, 2006) and the social learning this experience had precipitated was already leading to close collaborations between the previously hazard affected and still exposed population and the risk-managing authorities . After the January 2005 event, a number of Flood Action Groups (FAGs) had already started to develop effective response measures in close collaboration with the emergency services.

Such endeavours easily fit under the UK Cabinet Office (2011) definition of community resilience, with its focus on response capacity and communities' ability to work collaboratively with the formal responding agencies during an event (see section 4.3.1). However, what could be clearly seen during the research was a wider community engagement that went beyond simply preparing for and responding to a hazard event. A strong-advocacy centred mode of social-networking led campaigning was also evident. Whether it was reflected in the FAGs persistence in developing various location-specific emergency plans and advocating for various structural and non-structural risk mitigation measures, or in local-commerce focussed organisations intent on returning their businesses to profitability, or in partnerships of land-owners and managers working to ensure their land remained as productive as possible, the role of social networks engaging in the process of risk-mitigation was clearly evident. From the perspective of the emBRACE framework, it was clear that resilience, in terms of the communities' capacity to achieve effective actions (Preparedness, Response, Recovery, Mitigation) is well evidenced, within a complex and largely complementary mix of approaches to flood risk mitigation, even if those actions are more effective for some than for others.

Taking a Sustainable Livelihoods Approach (SLA) this case study can also identify that a full range of resources and capacities were mobilised by the flood-affected population, with different resources being vital in the development of action-based responses that reduced the risk of disaster. Whether such disaster threatened at the scale of a household or a community, the 'resourcefulness' exhibited by many community members, as well as people in governance positions, illustrated an admirable capacity for civil protection, but also concern over more the time-extended well-being (i.e. social protection) of this population; as was evidenced by the local authority staff's coordination of the 3rd Sector activities during recovery period.

Whilst a range of management techniques and technologies have been deployed, principal amongst all measures adopted by town residents was the focus on the protective role of concrete, metal and glass as components of structural defence measures. This focus on *hazard* management (i.e. rather than *risk* management), has been critiqued since White wrote is seminal thesis on the human adjustment to floods hazards in the mid twentieth century (White, 1945). However, it appears that the legacy of place-based and other resources that are situated along this (and probably many other catchments in Europe) are of such value (financial, economic, cultural, even ontological: see Harries, 2008) that there is little public appetite for doing anything other than defending the built environment largely as is.

In the next section the key attributes that were identified to have an impact on the respective 'geographical communities' are assessed relative to the three domains of the emBRACE framework; potential indicators are then proposed.

7. Tabulation of key themes emerging from cross geographical-community investigation and identification of central indicators for assessing community resilience

This section comprises tables derived from a comparative analysis of the key resilience factors that emerged from this interview-based study. The five case-study geographical 'communities' are entered as columns, with cross tabulation carried out across rows defining the domains of the emBRACE framework, primarily under an appropriate SLA resource or capacity set (see, table 4.1, section 5.2). They are then sub categorised under the appropriate Action stage (i.e. Preparedness actions such as flood warning is demonstrably different from Recovery actions such as purchasing insurance or dealing with a loss adjuster). Finally, where appropriate they are sub-categorised under Learning.

The final column contains numbers that relate to the relevant 'indicator' that has been proposed as potentially offering the capacity to directly measure a key aspect of that factor or a proxy for it. A list of selected attributes of the proposed indicators can be found at the end of the report (Appx 4).

NB. Both this original SLA_Table and the UoN Proposed Indicator Excel sheet are archived on the North of England case-study page project website www.embrace-eu.org

Resource / Capacity	Action	Learning	Rural: Farming	Rural: Other	Keswick	Cockermouth	Workington	Proposed Indicator
Natural / Place-based	N/A		Legacy of land-use and land-management practices (e.g. pasture) predicate specific vulnerability to flood events	Small numbers of people exposed to fluvial / pluvial flood risks across range of contexts (e.g. isolated, village)	Position at confluence of rivers means high risk of repeat flooding	Position at confluence of rivers means high risk of repeat flooding	Topography means that few are directly exposed to high-magnitude flood hazard, but event illustrated wider systemic vulnerablity to infrastructure damage.	**1,2**
	Preparedness		Communications infrastructure resilience is a key element in rural preparedness	Communications infrastructure resilience is a key element in rural preparedness				**3, 4, 5**
		Learning	Innovative communications methods may be required to provide sufficient lead time in rural communities with poor IT infrastructure	Innovative communications methods may be required to provide sufficient lead time in rural communities with poor IT infrastructure			Innovative communications methods may be required to provide sufficient lead time in isolated communities with poor IT infrastructure	**5, 23, 25, 27, 28**

	Recovery				Key role identified for social-networking facilities during recovery (i.e. soup kitchen)	Key role identified for social-networking facilities during recovery (i.e. Christ Church)		**7**
	Mitigation		Potential conflicts remain over policy shift toward re-naturalising watercourses and the sustainability of hill-farming	Isolated and village dwellings remain exposed to residual risks from high-magnitude flood events	Residual risks remain which continue to expose areas of town to the effects of high-magnitude flood events	Residual risks remain which continue to expose areas of town to the effects of high-magnitude flood events	Residual risks remain which continue to expose areas of town to the effects of high-magnitude flood events	**1,2**
							Bridge repair has reduced likelihood of repeat of transport disruption, but illustrates the need for infrastructure to be designed to incorporate low-probability, high-consequence hazard effects	**3,4**

							Bridge repair has reduced likelihood of repeat of transport disruption, but illustrates the need for infrastructure to be designed to incorporate low-probability, high-consequence hazard effects	**3, 4**
		Learning					Need identified to develop contingencies for 'worst-case' infrastructure failure and disruption	**12**
Resource / Capacity	**Action**	**Learning**	**Rural: Farming**	**Rural: Other**	**Keswick**	**Cockermouth**	**Workington**	**Proposed Indicator**
Socio-Political	**Preparedness**	**Learning**	An effective early warning is a fundamental civil-protection requirement	An effective early warning is a fundamental civil-protection requirement	An effective early warning is a fundamental civil-protection requirement	An effective early warning is a fundamental civil-protection requirement	An effective early warning is a fundamental civil-protection requirement	**23, 25**

				The presence of an effective emergency planning/action group provides a key link between communities and civil/social protection practitioners	The presence of an effective emergency planning/action group provides a key link between communities and civil/social protection practitioners	The presence of an effective emergency planning/action group provides a key link between communities and civil/social protection practitioners	The presence of an effective emergency planning/action group provides a key link between communities and civil/social protection practitioners	**19,20**
			Resource-intensive communications methods may be required to provide sufficient lead time in isolated and vulnerable communities	Resource-intensive communications methods may be required to provide sufficient lead time in isolated and vulnerable communities	Resource-intensive communications methods may be required to provide sufficient lead time in isolated and vulnerable communities	Resource-intensive communications methods may be required to provide sufficient lead time in isolated and vulnerable communities	Resource-intensive communications methods may be required to provide sufficient lead time in isolated and vulnerable communities	**24**
	Response		Farming community holds resources and capacities to assist community during events (self-help)	Safety-related protocols for flood warden activities evolving in communities with CEP	Clear safety-related protocols for flood warden activities during response	Clear safety-related protocols for flood warden activities during response	Evolving safety-related protocols for flood warden activities during response	**21, 27,**
				For effective response, rural community CEP groups need to be fully integrated into formal response (linked call-out protocols)				**24**

				Planned, community-based flood response is likely to be most effective if it utilises people whose homes are not at direct risk from hazard	Planned, community-based flood response is likely to be most effective if it utilises people whose homes are not at direct risk from hazard	Planned, community-based flood response is likely to be most effective if it utilises people whose homes are not at direct risk from hazard	Planned, community-based flood response is likely to be most effective if it utilises people whose homes are not at direct risk from hazard	**17,20**
	Recovery	**Learning**	Community of Practice should integrate key elements of civil protection (prep/response) and long-term social protection (recovery/mitigation)	Community of Practice should integrate key elements of civil protection (prep/response) and long-term social protection (recovery/mitigation)	Community of Practice should integrate key elements of civil protection (prep/response) and long-term social protection (recovery/mitigation)	Community of Practice should integrate key elements of civil protection (prep/response) and long-term social protection (recovery/mitigation)	Community of Practice should integrate key elements of civil protection (prep/response) and long-term social protection (recovery/mitigation)	**9, 10, 19**
				Cultural differences between 'off-comers' and farmers can result in constraints on adaptive potential (e.g. difficulty in getting farmers to consider catchment scale FRM measures to reduce risks downstream, because their land is more valuable to them without)			Key long-term recovery/welfare coordination role for statutory-authority staff	**10,**

			Local farming interests acted as key driver of outcome delivery (where it had been absent previously). Growth promoters regarded recovery as 'an opportunity'			Local business interests acted as key driver of outcome delivery (where it had been absent previously). Growth promoters regarded recovery as 'an opportunity'		**14, 22**
					IEM approached holistically: made possible due to dual-nature of FAG membership (response/advocacy)			**19**
			Affected communities should be directly represented in strategic recovery-coordination groups in order to avoid the risk of 'doing recovery to these people not with them'	Affected communities should be directly represented in strategic recovery-coordination groups in order to avoid the risk of 'doing recovery to these people not with them'	Affected communities should be directly represented in strategic recovery-coordination groups in order to avoid the risk of 'doing recovery to these people not with them'	Affected communities should be directly represented in strategic recovery-coordination groups in order to avoid the risk of 'doing recovery to these people not with them'	Affected communities should be directly represented in strategic recovery-coordination groups in order to avoid the risk of 'doing recovery to these people not with them'	**28**

			Key welfare/guidance role for agricultural coordinator		Key long-term recovery/welfare coordination role identified for statutory-authority staff	Key long-term recovery/welfare coordination role identified for statutory-authority staff	Key long-term recovery/welfare coordination role identified for statutory-authority staff	**35, 36, 37**
					The 3rd Sector can provide a key role in delivering support during recovery (e.g. Soup Kitchen)	The 3rd Sector can provide a key role in delivering support during recovery (e.g. Flood Angels)		**11**
	Mitigation		Farming community can be isolated and exclusive, but key individuals and facilitators have illustrated potential to negotiate rural FRM outcomes	Various community-scale planning forums have shown themselves useful in developing risk-management outcomes	FAG highly politically engaged and influential in determining FRM outcomes.	FAG highly politically engaged and influential in determining FRM outcomes.	FAG (predominantly flood affected membership) limited in ability to engage influential support from community.	**17, 18, 22, 25, 28**

			Cultural differences between 'off-comers' and farmers can result in lack of adaptive potential (e.g. difficulty in getting farmers to consider catchment scale FRM measures to reduce risks downstream, because their land is more valuable to them without)	Cultural differences between 'off-comers' and farmers can result in lack of adaptive potential (e.g. difficulty in getting farmers to consider catchment scale FRM measures to reduce risks downstream, because their land is more valuable to them without)	Community of Practice integrates key elements of civil protection (preparedness/response) and long-term social protection (recovery/mitigation)	Community of Practice integrates key elements of civil protection (preparedness/response) and long-term social protection (recovery/mitigation)	Community-based CEP largely focussed on response-related planning,	**8, 9, 10**
		Learning	10-Step CEP promoted throughout community of practice offers opportunity for communities to engage in developing contingencies for all-risks (not just FRM)	10-Step CEP promoted throughout community of practice offers opportunity for communities to engage in developing contingencies for all-hazards and risks (not just FRM)	10-Step CEP promoted throughout community of practice offers opportunity for communities to engage in developing contingencies for all-hazards and risks (not just FRM)	10-Step CEP promoted throughout community of practice offers opportunity for communities to engage in developing contingencies for all-hazards and risks (not just FRM)	10-Step CEP promoted throughout community of practice offers opportunity for communities to engage in developing contingencies for all-hazards and risks (not just FRM)	**12, 13, 14, 15, 16, 17, 19, 35,36,**

			Innovative participatory processes have led to local FRM outcomes, but at the expense of some conflict between national policy and local agri-business sustainability					**9, 10, 22**
						Need identified to develop contingencies for 'worst-case' hazard effects on local businesses	Need identified to develop contingencies for 'worst-case' hazard effects on local businesses	**8, 9**
			Effective FRM requires long-term engagement by trained staff in order to build trust with communities. This includes candid approaches to expectation management	Effective FRM requires long-term engagement by trained staff in order to build trust with communities. This includes candid approaches to expectation management	Effective FRM requires long-term engagement by trained staff in order to build trust with communities. This includes candid approaches to expectation management	Effective FRM requires long-term engagement by trained staff in order to build trust with communities. This includes candid approaches to expectation management	Effective FRM requires long-term engagement by trained staff in order to build trust with communities. This includes candid approaches to expectation management	**29, 30, 31, 32, 33, 34, 36**

			Catchment scale processes affect different communities in different ways, therefore, catchment-scale FRM-deliberation processes require cross-community participation	Catchment scale processes affect different communities in different ways, therefore, catchment-scale FRM-deliberation processes require cross-community participation	Catchment scale processes affect different communities in different ways, therefore, catchment-scale FRM-deliberation processes require cross-community participation	Catchment scale processes affect different communities in different ways, therefore, catchment-scale FRM-deliberation processes require cross-community participation	Catchment scale processes affect different communities in different ways, therefore, catchment-scale FRM-deliberation processes require cross-community participation	**10**
Resource / Capacity	**Action**	**Learning**	**Rural: Farming**	**Rural: Other**	**Keswick**	**Cockermouth**	**Workington**	**Proposed Indicator**
Human	**Preparedness**	**Learning**	Farming community has illustrated adaptive potential in face of multiple chronic livelihood threats (e.g. diversification). Key individuals are engaged with FRM, with this regarded as positive advocacy for cultural values				Individuals' engagement with long-term FRM marked by frustration at failure to deliver major scheme	**32, 33, 34**
			CEP can elicit effective responses from engaged community members	CEP can elicit effective responses from engaged community members	CEP can elicit effective responses from engaged community members	CEP can elicit effective responses from engaged community members	CEP can elicit effective responses from engaged community members	**17**

	Response		Regardless of presence of CEP spontaneous responders will emerge and can be effective in reducing impacts but their activities can increase their individual and social risks	Regardless of presence of CEP spontaneous responders will emerge and can be effective in reducing impacts but their activities can increase their individual and social risks		Regardless of presence of CEP spontaneous responders will emerge and can be effective in reducing impacts but their activities can increase their individual and social risks	Regardless of presence of CEP spontaneous responders will emerge and can be effective in reducing impacts but their activities can increase their individual and social risks	**18, 24, 38**
	Recovery				Flood and resultant recovery process can inflict psychological stress on anyone, including key community 'champions'	Flood and resultant recovery process can inflict psychological stress on anyone, including key community 'champions'	Flood and resultant recovery process can inflict psychological stress on anyone, including key community 'champions'	**11, 35, 36**
	Mitigation	Learning			Mature, community-based FRM driven by key individuals with persistence and sophisticated understanding of physical/hydrological challenges and FRM bureaucracies .	Mature, community-based FRM driven by key individuals with persistence and sophisticated understanding of physical/hydrological challenges and FRM bureaucracies .	Agency-driven CEP process adopted by flood-exposed individuals	**17, 19, 20**

				Key natives and 'off-comers' can be particularly 'resourceful' in terms of protecting interests. Persistence regarded as required personal trait	Repeated flood experience leads to greater engagement in FRM	Repeated flood experience leads to greater engagement in FRM	Prevalence of probabilistic risk perception in hazard exposed	**6, 17, 18, 19, 20**
Resource / Capacity	**Action**	**Learning**	**Rural: Farming**	**Rural: Other**	**Keswick**	**Cockermouth**	**Workington**	**Proposed Indicator**
Financial	**Recovery**		Agri-environmental schemes (e.g. HLS) are of principle importance in defining farmers' FRM activity					**45**
				Access to insurance key in enabling physical recovery	Access to insurance key in enabling physical recovery	Access to insurance key in enabling physical recovery	Access to insurance key in enabling physical recovery	**41**
			Lack of access to insurance for key agricultural outputs increases vulnerability and reliance on flexible agri-grant schemes					**45**

					Recovery-gap' issues obvious in the challenges faced by homeowners in restoring their properties (e.g. with negotiations with insurers, loss-adjusters and builders)	Recovery-gap' issues obvious in the challenges faced by homeowners in restoring their properties (e.g. with negotiations with insurers, loss-adjusters and builders)	Recovery-gap' issues obvious in the challenges faced by homeowners in restoring their properties (e.g. with negotiations with insurers, loss-adjusters and builders)	**11,35**
			Means-tested charitable grants awarded to some farmers	Means-tested charitable grants awarded to some residents	Means-tested charitable grants awarded to some residents	Means-tested charitable grants awarded to some residents	Means-tested charitable grants awarded to some residents	**43, 44**
	Mitigation		Gravel management dependent on consenting process and at direct cost to land-owner					**36, 45**
				Cost:benefit criteria mean little realistic chance of major scheme, so exposed community limited to PLP measures	Defra-funded major Fluvial scheme, but other measures (e.g. pumps) funded through Community of Practice fund raising and FAG advocacy	FAG, CCoT acted as key facilitators in drawing funding for structural measures, including supporting the balot for raising funds through council-tax precept		**36, 42, 43**

							Major infrastructure restored through national budgets and as insured loss	**42**
				Recovery assisted by presence of central charitable institution (e.g. donation towards PLP)	Recovery assisted by presence of central charitable institution (e.g. donation towards scheme)	Recovery assisted by presence of central charitable institution (e.g. donation towards scheme)	Recovery assisted by presence of central charitable institution (e.g. donation towards PLP)	**42, 43, 44**
		Learning		Innovative participatory processes have led to local Civil Protection outcomes, but FRM outcomes still constrained by cost:benefit limits and lack of evidence for efficacy of catchment-scale measures		Pragmatic understanding that scheme "not to keep water out, but to keep insurance in"	Community-sourced charitable grants regarded as insufficient to cover cost of effective PLP in vulnerable properties	**36, 42, 43, 44**
					Housing associations implemented lessons learned during 2005 event to improve recovery experience of tenants	Housing associations implemented lessons learned during 2005 event to improve recovery experience of tenants		**16**

Resource / Capacity	Action	Learning	Rural: Farming	Rural: Other	Keswick	Cockermouth	Workington	Proposed Indicator
Physical	Preparedness		Communications infrastructure resilience is a key element in rural preparedness	Communications infrastructure resilience is a key element in rural preparedness				3, 4, 5
		Learning	Innovative communications methods may be required to provide sufficient lead time in rural communities with poor IT infrastructure	Innovative communications methods may be required to provide sufficient lead time in rural communities with poor IT infrastructure				5, 23, 25, 27, 28
	Recovery				Key need identified for community-based social-networking facilities during recovery (i.e. soup kitchen)	Key need identified for community-based social-networking facilities during recovery (i.e. Christ Church)		7
	Mitigation			Mitigation confined to smaller scale projects as major structural schemes would not meet cost:benefit critieria	Major structural scheme cited as key element in town's recovery	Major structural scheme cited as key element in town's recovery	Mitigation confined to smaller scale projects as major structural schemes would not meet cost:benefit critieria	40

							Bridge repair has reduced likelihood of repeat of transport disruption, but illustrates the need for infrastructure to be designed to incorporate low-probability, high-consequence hazard effects	**3, 4**
		Learning					Need identified to develop contingencies for 'worst-case' infrastructure failure and disruption	**12**

8. Conclusion: 'Community Resilience' at the Catchment Scale: Balancing Civil and Social Protection Needs and Priorities

Investigating 'community' resilience to natural hazards along a short river catchment presents problems of quantification and qualification. The very question "which community are we talking about?" revealed there to be any number of population groups who could be categorised as bearing an interest. Flood impacts along the course of the catchment varied. The inundation of fertile pasture meant that farmers in the high catchment saw their, already multiply-stressed, businesses placed under further strain, whilst townspeople and businesses further downstream also experienced devastating damage to their homes, livelihoods and psychological security.

That the population affected by the 2009 flood has visibly 'recovered' can, to a large extent, be attributed to the hard work of individuals as well as groups and networks operating through a range of institutions at a number of scales. Individual 'Floodees' have laboured to return their own properties to functionality. The Flood Action Groups have worked closely with the formal agencies in 'Communities of Resilience Practice' (CoRP), which have grown and developed through processes of social learning. They have done this in ways that have built both their own capacities to respond to a future event, but also enabled and encouraged them to advocate – often vociferously – for mitigation measures to be developed to protect them. The personnel and staff of the civil protection agencies and statutory and 3rd sector social protection practitioners have been stretched, during a period of concurrent financial austerity, to assist their communities to get back to 'normal'. Part of this assistance has required them to encourage and/or to compel communities to take responsibility for their own resilience.

The aims of the case-study were:

1. To identify the resource and capacity sets required by a community to build resilience toward flood events and the capabilities required to mobilise these resources.

2. To assess how social factors such as trust, accountability, cooperation, power and influence interact to influence the mobilisation of resources.
3. To devise indicators of community resilience that encompass the resource sets, action phases (mitigation, etc.) and social learning dimensions that are at the heart of the emBRACE general framework

In respect to the first aim, the research confirmed the complex mix of resource and capacity sets that comprise the core of community disaster resilience. While civil protection dimensions remain key facilitators, they cannot effect fully resilient outcomes unless developed in concert with the broader social protection objectives and alongside a cohort of engaged community members. The varying outcomes for Keswick and Cockermouth on one hand and Workington on the other go some way to evidence the need for an effective 'Community of Resilience Practice'.

The complexity of the relationships between resources/capacities, actions and learning was evident, as the lens passed down the catchment from the Fells to the sea and perfectly illustrated the difficulty in compartmentalising 'Community Resilience' as any simple, uniform component of a population's makeup: the even greater complexity of the cross-context indicator sets is a demonstration of this. Some key attributes did emerge, however. For example, the social network maps in Box 6.1, (p.46), illustrate very effectively the complex lateral bonding and bridging nature of key individuals' social networks at community level, but they also reveal how effective these people are at linking hierarchically (often on first-name terms) into power relationships. The potential role of people like this in facilitating concerted community engagement with risk mitigation and resilience building should not be underestimated or devalued. However, it should not be forgotten that this engagement can also come at considerable personal cost to them, especially if these individuals have been directly flood affected themselves. Furthermore, if so much of a community's resilience is based on one or a small number of individuals does this not also point to a vulnerability, or at least a lack of redundancy, at its heart that the presence of strong, accountable, institutional services and support ('social protection' broadly understood) should go some way to alleviate?

In relation to the second aim, to build trust in FRM bureaucratic processes and civil protection procedures within a catchment, which inevitably encompasses a range of communities with varying access to resources and capacities, requires a dynamic appreciation of balance and social equity. Without this there is a risk that isolated and vulnerable communities will be left to spectate as those with louder voices, greater savvy and more political linkage receive more investment (e.g. financial, emotional, temporal), simply because they are more able to manipulate the 'rules of

the game' in their own favour. Such challenges lie at the heart of the social equity concerns that underpin the Sustainable Livelihoods Approach.

In essence, however, the process that could be said to have underpinned community resilience across the social scales and catchment features investigated, revealed itself to be contextually complex and rich in its capacity – either latent or pre-existing – to expand, extend or to emerge (Dynes, 2005b) within any number of social, or community situations. Key factors in determining how resilient the households, businesses and communities were relative to each other, included, as already summarised, the presence and engagement of 'resourceful' individuals (within the community itself or as enablers working within community-facing organisations), but also place-based factors such as the availability of a formal warning systems and loss-sharing mechanisms. The importance of understanding any community's capacity and willingness to trust in authority appeared to be a key attribute.

Austerity and the intense competition for the financial resources in Defra's FRM budget provided a backdrop against which many smaller communities were being encouraged to do what they could for themselves. Even large physical schemes needed a community contribution, but in Cockermouth such a scheme came to fruition. This was achieved through the collaborative efforts of the town's FAG the local authority and other flood-management agencies. The fact that physical defence structures formed such a focus of attention cannot, however, be ignored from a resilience perspective. This is because we should all be cognisant of the conclusive critique in the literature regarding the tendency of structural measures to increase rather than to reduce flood risk (Brown and Damery, 2002, Parker, 1995, White et al., 2001). In terms of resilience in the Derwent catchment, however, it was the presence or lack of engineered solutions that went furthest toward underpinning people's psychological ability to manage the risks to which they remain exposed:

> "I don't know at which point you get to that … point of saying '*actually we have bent out of shape so much that there is no more elasticity; we have to change things*'. And that's not the same as returning to a normality. What we're talking about is there is fundamental transformation and I don't think we're there yet with flooding in Cumbria, because it's easier to build, to do the King Canute thing of trying to hold things back, rather than move great chunks of [our towns]." C47_M_1

What these investigations revealed quite clearly was that resilience, as it is defined by the IPCC (2014) is powerfully represented along this catchment. It has, however, been won over a period of years through the experience of repeat (flood) events. It

has also been won at higher cost to those directly impacted by those events than to those who have not been. There is clear evidence of the capacity exhibited by the catchment's social, economic, and environmental systems to cope with a high magnitude flood event as well as with other disturbances. They have also responded to and reorganised themselves in ways that maintain their essential function, identity, and structure and they have adapted and learned, while also perhaps maintaining a capacity for transformation[23] that may only truly be operationalised once some future tipping point is crossed. Whether the next high-magnitude flood to strike pushes one or more of the communities studied here over that remaining threshold remains difficult to assess.

This report has corroborated the understanding that, even in the close spatial confines of a short river catchment, different geographical communities need to access and utilise different resource sets and capacities to maintain their resilience to hazards. However, it has also identified that engaged Communities of Resilience Practice (CoRP) offer significant potential in working collaboratively toward disaster-risk reduction outcomes at these catchment scales. A challenge is also offered, however, in the way that CoRP's have been identified as requiring a truly inclusive remit. This involves formal agencies understanding and supporting each other's roles, in deliberating and delivering a full range of capacity-building civil- and social-protection solutions that reflect sustainable, equitable and achievable outcomes at every point along the Integrated Emergency Management spectrum (i.e. not just preparedness and response) and for all communities they serve.

In completion of the final aim, the set of qualitatively-determined indicators proposed in this report offers Communities of Resilience Practice potentially useful metrics with which to measure the resilience of their hazard-exposed population over time, but also a means through which to illustrate *to each other* the complex range of community attributes that they *each*, and therefore by association, they *all* need to nurture if their risk reduction mandate is to be achieved.

[23] Transformation: "The altering of fundamental attributes of a system (including value-systems; regulatory, legislative or bureaucratic regimes; financial institutions; and technological or biological systems) emBRACE Glossary (2012)

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12. Appendices

Appendix 1: Interview Topic Guide

Appendix 2: Interview Analysis: codes and themes

Appendix 3: Sample SNM analysis data

Appendix 4: Summary list of proposed indicators

Appendix 5: Maps

Appendix 1:

emBRACE interviews Cumbria: topic guide

About you

Name, role, how long lived/worked in [town/area/Cumbria]?

'**Community'**

How would you describe [town/area] in terms of it being **'a community'**?

If other people in [town/area] talk about the local 'community' who do you think they are referring to?

Resilience

What is your **understanding of** the word **resilience** and how it relates to flood risk management in [town/area/Cumbria]?

What do you think are the characteristics of **a flood resilient community**?

The flood event

Our research is primarily focused on understanding how the population of [town/area] thinks about and responds to flood threats, therefore:

> … can you please give an account of **your experience of flooding** and how it has affected you?

In terms of returning to 'normal' life after the flood, how quickly do you think this was achieved…

> … by you?
>
> … by the population of [town/area]?

How useful were the aid and services provided in [town/area] following the flood/s?

What do you think were **the good and not so good things done to support those affected**?

Were there people or groups who were particularly vulnerable during the flood?

Did they receive **effective support**?

How was this coordinated?

Could you please explain what you think was the **hardest part of getting back to 'normal'** after the flood/s?

For you personally?

For [town/area]?

What do you think could be done to **improve the time that it takes** to get back to 'normal' after a flood (what resources would be most useful for) …

individuals/households?

[town/area] as a whole?

What are the **lessons that have been learned** following the 2009 and other floods?

What have you learned, personally?

What has the [town/area] community learned?

Who do you think learned the most?

How has this learning been illustrated?

Do you feel that **good decisions are being made** with regards to reducing the threat of flooding by local leaders and authorities?

Examples?

As time passes, do you think that local resilience to flooding will improve, stay at today's levels, or tail off?

What factors do you think will influence this (e.g. **institutional memory**)?

What was the **state of community flood resilience** in [town/area] prior to the flood event/s?

+ on a scale of 1-10

In your opinion, how did the state of community resilience in [town] change as a result of the flood event/s?

+ on a scale of 1-10

In relation to the idea of community flood resilience, who have been the most **influential** in developing this locally …

individuals

networks (social; in/formal governance; private sector)

What have they achieved and **how has this been enabled**?

In combination, or separate from the hazard event(s) themselves, have any **policy changes, social changes and/or environmental changes** affected the local resilience-building process; for better or worse?

Thinking more widely, how do you think the community resilience in [town/area] **compares to that in other locations along the Derwent Catchment** (i.e. from the High Fells to Workington)?

Thinking about all the characteristics of a flood resilient community that we have discussed, can you think of anything that might help us to **measure** resilience (e.g. internet access or the number of households exposed to flood hazards)?

> "The third (voluntary and community) sector needs to work to develop a stronger presence in strategic planning for community recovery at a County Level." (Riding, 2010: p11)

Has this happened? What gateways and barriers identified?

Appendix 2:

Interview Analysis: codes and themes

- Name – Code title
- Sources – number of interview transcripts referenced
- References – total number of references

Name		Sources	References
3RD SECTOR		26	79
Constraints on 3rd sector provisioning		33	116
Emergent behaviour		29	63
ADAPTIVE CAPACITY		36	131
Adaptive capacity - Constraints on		37	200
Adaptive Capacity - Gender		3	4
Diversification - Agri-Practice		15	110
Financial - Farm Payments		13	69
Diversification - Tourism		7	13
Transition		9	28
COMMUNITY		2	3
Communities of circumstance		32	118
Communities of geography		28	58
Communities of Identity		28	79
Culture - Farming Practice		20	132
CULTURE - Tradition		14	30
Communities of interest - practice		29	116
Communities of support		27	117
Community - diversity-disparity		25	73

Children		7	8
Elderly		13	15
Families with babies and school-age children		2	2
Gender		4	5
Middle-aged		0	0
Young People		6	12
Community - Intra-community conflict		17	50
Off-comers		12	22
Second home owners		5	9
Conflicts - community vs community		31	112
Exclusive communities		16	32
Rural-Urban divide		18	59
DISASTERS LOOP		2	2
CIVIL PROTECTION		4	6
Integrated Emergency Management (IEM)		35	148
Mitigation		31	54
Preparedness		33	98
Reconstruction		15	27
Recovery		25	70
Response		32	102
INDICATORS		10	26
LEARNING LOOP		2	4
Historical Events		39	134
Frequency		20	39
Individual learning		30	92
Social-Institutional Learning		53	395

MEDIA		17	28
RESILIENCE		3	4
Community Resilience		42	158
GOOD PRACTICE		24	74
Rapidity		15	40
Redundancy		13	26
Resilience Agenda - as institutionalised approach		20	53
Resilience characteristics		25	139
Resourcefulness		30	83
Robustness-Resistance		23	51
RESOURCES LOOP		3	3
Financial Capital		30	128
Insurance		26	70
Human		6	9
Human - Psychological effects		30	84
Concatenation of events		20	40
Secondary effects - Re-traumatisation		24	52
Human - Risk Perception		38	107
Human - Skills		32	92
Local Knowledge		35	135
Natural		1	1
Natural - Biodiversity		12	46
Natural - Gravel		22	108
Natural - Sustainability		24	168
Natural-Place-Based		34	245

Physical		4	5
Communications		19	36
Infrastructure		28	62
Structural Measures		28	71
'P'olitical		3	6
Advocacy		21	41
Governance - Austerity		21	35
Governance - Constriants		35	186
Governance - Financial		22	90
Governance - FRM		46	271
FAG - Advocacy		13	51
FAG - Advocacy-Activism		10	41
FAG - Response		18	50
Governance - Legacy		20	52
Governance - Participative		39	179
Governance - Private Sector		17	34
Governance - Sustainability		23	101
Knowledge Management		36	109
Political - Governance		28	69
Trust in Authority		35	113
Whole Catchment Planning		25	108
Social Capital		9	31
Key Boundary actors - objects		32	190
SocCap - Bonding		18	45
SocCap - Bridging		19	58

SocCap - Linking ('p'olitical capital)		19	57
SocCap - Reciprocity		6	12
SocCap - Trust		20	45
Social Capital - FRM		36	151
Social Capital - Rural		14	30
Sustainability - Social factors		15	44
SOCIAL PROTECTION		3	4
Social Protection - Community Engagement		26	54
Social Protection - Grants		14	51
Social Protection - Vulnerability assessment		24	64
THRESHOLDS		29	81
VULNERABILITY		8	32
Children		4	7
Physical - vulnerability		23	73
Social - vulnerability		17	45
Systemic - vulnerability		13	23

Appendix 3: Sample SNM analysis data

Interviewee	Interviewee code	Location	Organisation Sector	URN	Gender	Specific Location	General Location	Organisation / Institution	Organisation Sector	Purpose 1	Purpose 2	Purpose 3	Actions	Quality of Contact	Quantity of Contact	Reciprocity
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	2_Hill		Hilltown	Local	Governance - District scale	Governance (inc. blue lights	Collaborative working (hazard related)			Response	1	3	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C15_F_3-3_Hil	F	Hilltown	Local	3rd Sect - FAG	FAGs	FAG - advocacy	FAG - response	Collaborative working (h	Response	1	3	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C75_M_2_Hill	M	Hilltown	Local	Governance - District scale	Governance (inc. blue lights	FAG - advocacy	Collaborative working (hazard related)		Response	1	3	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C13_M_1C	M	Hilltown	Local	Emergency Services (inc. Mo	Governance (inc. blue lights	FAG - advocacy	Collaborative working (hazard related)		Response	1	3	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C49_F_1A	F	County	County	Environment Agency	Environment	FAG - advocacy	Collaborative working (hazard related)		Response	1	3	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	1C		County	County	Emergency Services (inc. M	ountain rescue)	Collaborative working (hazard related)			Response	1	3	1
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	3-1_M_Lions	M	County	County	3rd Sect - National/County	Community	Providing financial assistance	Collaborative working (hazard related)		Recovery	1	3	1
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	4_Hill		Hilltown	Local	Community' member	Community	Providing financial assistance			Recovery	1	2	1
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	3-1_Rotary_M_own.vill	M	Own village	Local	3rd Sect - National/County	Community	Providing financial assistance			Recovery	1	1	1
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C76_M_3-1_Hill	M	Hilltown	Local	Governance - Nat/County sc	Governance (inc. blue lights	Collaborative working (hazard related)			Recovery	1	3	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C77_M_5_Utilities	M	National	National	Private Sector	Building/Infrastructure	Collaborative working (hazard related)			Recovery	1	3	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C78_F_1A	F	County	County	Environment Agency	Environment	Providing hazard information	Collaborative working (hazard related)		Recovery	1	2	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C79_M_1_Hill	M	Hilltown	Local	Governance - Nat/County sc	Governance (inc. blue lights	Professional contact (other)			Recovery	1	1	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	3-4_soupkitchen_Hill		Hilltown	Local	Faith-based	Community	Providing emotional support	Collaborative working (hazard related)		Recovery	1	3	1
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C80_F_1B	F	County	County	Governance - Nat/County sc	Governance (inc. blue lights	Complaint about service	Collaborative working (hazard related)		Recovery	1	3	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C81_F_3-1_RedCross	F	National	National	3rd Sect - National/County	Community	Collaborative working (hazard related)			Recovery	2	2	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	1C_Police_M_Hill	M	Hilltown	Local	Emergency Services (inc. Mo	Governance (inc. blue lights	Collaborative working (hazard related)			Response	1	3	1
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	1_Royal_M	M	National	National	Governance - Nat/County sc	Governance (inc. blue lights	Providing emotional support			Recovery	1	1	1
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	1_TV_F	F	National	National	Governance - Nat/County sc	Governance (inc. blue lights	Providing emotional support			Recovery	1	1	1
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C61_M_1C_Army	M	County	County	Governance - Nat/County sc	Governance (inc. blue lights	Collaborative working (hazard related)			Response	1	2	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	C82_M_1A	M	National	National	Environment Agency	Environment	Professional contact (FRM)	Collaborative working (hazard related)		Mitigation	1	3	2
C04	C04-1_M_3-3_Hil	Hilltown	FAGs	3-1_CCF		County	County	Governance - Nat/County sc	Governance (inc. blue lights	Providing financial assistance			Recovery	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C92_M_4A_Hill	M	Hilltown	Local	Neighbour	Community	Providing Physical Support (FRM)			Response	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C49_F_1A	F	County	County	Environment Agency	Environment	Providing hazard information			Preparation	1	1	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C76_M_3-1_Hill	M	County	County	Governance - Nat/County sc	Governance (inc. blue lights	Collaborative working (hazard related)			Preparation	2	1	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C50_M_1A	M	County	County	Environment Agency	Environment	Providing hazard information	Collaborative working (hazard related)		Preparation	1	1	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C93_M_1	M	National	National	Governance - Nat/County sc	Governance (inc. blue lights	Providing hazard information			Recovery	1	1	1
C15	C15_F_3-3_Hil	Hilltown	FAGs	C94_M_3-3_Hill	M	Hilltown	Local	Governance - District scale	Governance (inc. blue lights	FAG - advocacy	FAG - response	Collaborative working (h	Recovery	1	3	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C04-1_M_3-3_Hil	M	Hilltown	Local	3rd Sect - FAG	FAGs	FAG - response	Collaborative working (hazard related)		Preparation	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	2_Clerk_F_Hill	F	Hilltown	Local	Governance - District scale	Governance (inc. blue lights	Collaborative working (hazard related)			Preparation	1	1	1
C15	C15_F_3-3_Hil	Hilltown	FAGs	2_Councillor_M_Hill	M	Hilltown	Local	Governance - District scale	Governance (inc. blue lights	FAG - response	Collaborative working (hazard related)		Response	1	3	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	5_consultants		National	National	Private Sector	Environment	Providing hazard information			Mitigation	1	1	1
C15	C15_F_3-3_Hil	Hilltown	FAGs	1A		National	National	Environment Agency	Environment	Providing hazard information			Mitigation	2	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	2_councils		Own village	County	Governance - District scale	Governance (inc. blue lights	Providing financial assistance			Mitigation	2	2	1
C15	C15_F_3-3_Hil	Hilltown	FAGs	5_hotel_Hill		Hilltown	Local	Private Sector	Community	Providing Physical Support (FRM)			Recovery	1	2	1
C15	C15_F_3-3_Hil	Hilltown	FAGs	4A_Hill		Hilltown	Local	Neighbour	Community	Seeking emotional support	Seeking Physical support (FRM)		Recovery	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	2_Mayor_Hill	M	Hilltown	Local	Governance - District scale	Governance (inc. blue lights	Providing hazard information			Recovery	2	1	1
C15	C15_F_3-3_Hil	Hilltown	FAGs	2_M_GP_Hill	M	Hilltown	Local	Governance - District scale	Governance (inc. blue lights	Providing emotional support			Recovery	1	1	1
C15	C15_F_3-3_Hil	Hilltown	FAGs	5_builders_Hill		Hilltown	Local	Private Sector	Building/Infrastructure	Providing Physical Support (FRM)			Recovery	1	1	1
C15	C15_F_3-3_Hil	Hilltown	FAGs	5_builders		National	National	Private Sector	Building/Infrastructure	Providing Physical Support (FRM)			Recovery	2	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	5_business_Hill		Hilltown	Local	Private Sector	Community	Providing financial assistance			Recovery	2	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C04-2_F_3-3_Hil	F	Hilltown	Local	Community' member	Community	Providing emotional support			Recovery	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C18-1_F_3-3_Hil	F	Hilltown	Local	Community' member	Community	Providing emotional support			Recovery	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C18-2_M_3-3_Hil	M	Hilltown	Local	3rd Sect - FAG	FAGs	Providing emotional support			Recovery	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C95_F_4_Hill	F	Hilltown	Local	Community' member	Community	Providing emotional support			Recovery	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C96_M_4A_Hill	M	Hilltown	Local	Neighbour	Community	Seeking Physical support (FRM)			Response	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C97_F_4A_Hill	F	Hilltown	Local	Neighbour	Community	Providing Physical Support (FRM)			Response	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C98_M_4A_Hill	M	Hilltown	Local	Family member	Community	Providing emotional support	Providing Physical Support (FRM)		Response	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C99_M_5_surveyor	M	County	County	Private Sector	Building/Infrastructure	Providing hazard information			Recovery	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C100_F_4A_Hill	F	Hilltown	Local	Neighbour	Community	Providing hazard information			Recovery	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C101_M_4A_Hill	M	Hilltown	Local	Neighbour	Community	Providing Physical Support (FRM)			Mitigation	1	2	2
C15	C15_F_3-3_Hil	Hilltown	FAGs	C102_M_4A_Hill	M	Hilltown	Local	Neighbour	Community	Providing Physical Support (FRM)			Mitigation	1	2	2

Appendix 4:

Proposed Indicator-Set (key attributes): Community Resilience (UoN)

Indicator 1		Indicator 2	Description of evaluation
Short naming	**Number**	**Detail**	**Detail**
Hazard Exposure - built environment	1	Flood-zone occupation	% of hazard-exposed residential buildings as percentage of all residential buildings
Hazard Exposure - built environment	2	Flood-zone commerce	% of hazard-exposed retail and commercial buildings as percentage of all retail and commercial buildings
Networked Critical Infrastructure* (CI) exposed	3	CI in hazard zones (no. as % of all CI in type, e.g. primary road miles, water treatment facilities)	% of key infrastructure lying within hazard zones (by domain)
CI: Transport Route redundancy	4	Redundancy in transportation routeing (i.e. short-distance alternatives)	Alternative primary routes into community (1 route = 0 redundancy)
Communications - Broadband	5	% population with access to >2MB Broadband connectivity	% households in at-risk areas connected to >2MB broadband. Analysis through address-point resolution and hazard outline GIS layers
Previous Hazard Experience	6	Geographical Community's prior experience with hazard	Research-derived evidence that Geographical Community has been exposed to previous hazard events
Pre-identified rest-centres / social-support facilities	7	Community-identified rest and/or support centre	Identification of community-appropriate buildings to be used for rest and social support during and after event (e.g. a 'Soup kitchen') - with redundancy

Risk Assessment	8	Structured (top down) risk assessment	Civil Protection practitioners / responders should have developed a community scale risk register
Risk Assessment	9	Existence of participatory risk assessment process	Do civil-protection practitioners and local residents/community members share a forum through which to assess and plan for local risks?
Whole Catchment Planning	10	Existence of whole-catchment flood-risk management planning process/forum	Presence of cross-sector FRM planning process/forum at catchment scale
3rd Sector coordination	11	Presence of 3rd sector emergency coordination body	Interviews with 3rd sector stakeholders
Business BCM plan - Networked Critical Infrastructure* (CI) exposed - contingency plan	12	Existence of contingency plans for dealing with impacts on CI in hazard zones	Existence of integrated and validated CI BCM plans by sector (Transport, Communications, Water, Energy)
Business BCM plan - Business community	13	No. of local businesses with Business Continuity Mge. (BCM) plan	Survey-derived: No. of companies with BCM plans as % of all SMEs within location
Business BCM plan - Business institutions	14	Chamber of Commerce with BCM workstream	Key-stakeholder interview derived: presence of BCM plan Y/N
Business BCM plan - Community Services	15	Community services with BCM workstream (e.g. surgeries, pharmacies, etc.)	Survey-derived: No of local service delivery centres in location with BCM plan as % of all deliverers
Business BCM plan - Housing providers	16	Public and Private sector Social-Housing providers have emergency BCM plan related to provision for affected tenants	Key-stakeholder interview derived: presence of BCM plan Y/N
Community Emergency Plan (CEP)	17	Exposed community has an adopted/tested Community Emergency Plan (CEP)	A resilient community will have a CEP in place
Community Emergency plan - Household	18	Household emergency plans (HEP) in exposed area	High % of HEPs = resilient, Low = less resilient

Hazard Action Group -	19	Existence of committee-led HAG	Is there a HAG operating in the geographical/hazard area?
Hazard Action Group - composition	20	Membership split between hazard exposed and unexposed	Membership of HAG does not consist solely of people whose residence is within delineated hazard zones
Community response - IEM integration	21	Community Emergency Response linked to agency response	Community representation in multi-agency response
Community planning	22	Presence of formally-constituted community-based planning group (e.g. Neighbourhood Planning)	Number of formally constituted participatory and/or democratically elected planning groups in the location (e.g. Parish Council)
Non-Structural	23	Early-warning system (EWS) in exposed area	Is there a Total Flood Warnng System in place for at-risk communities? (Parker, 2003 - see comment)
Warning & Informing - Community response - IEM integration	24	Community Emergency Response linked to agency Integrated Emergency Management (IEM) response	Presence of CEP/Warden activation/call-out protocols in control room SoPs/Plans
Warning & Informing - Households	25	Households registered to EWS	% of exposed community supported by an IT-based early-warning system for which they receive membership notifications and updates?
Warning & Informing - Location-based SMS alerting	26	Existence of strategy and protocols for location-based or cell-broadcasting of warning messages and risk information (eg. via SMS)	Protocols for cell broadcasting in at-risk area (e.g. Police control room SoPs, LA emergency plans)
Warning & Informing - Social Media	27	Existence of strategy and protocols for broadcasting warning messages and risk information via social media (e.g. Community Messaging)	Protocols for use of social-media based EWS and risk information by civil protection staff
Strategic Recovery Group	28	Strategy and protocols in place for community representation on strategic-level recovery-management group (e.g. LA, town	Strategy and protocols detailed in emergency plans

		or municipal council)	
Community Cohesion	29	Hazard-exposed communities possess high levels of community cohesion	Social cohesivness is a factor in defining levels of social capital
Social Capital - Networks	30	Hazard-exposed communities possess high levels of social capital (bonding, bridging, linking)	Social networks provide structures for the generation of social capital
Social Capital - Social Trust	31	High levels of social trust, as measured by standard survey questions	Social trust is a factor that underpins social capital
Social Norms - Trust in Authority	32	High levels of trust in authority	Trust in Authority is a factor in defining how individuals engage with formal agencies/organisations
Social Norms - Sense of belonging	33	High levels of sense of belonging in 'community'	High levels of sense of belonging would indicate stronger sense of community
Social Norms - Place Attachment	34	High levels of place attachment	High levels of place attachment could indicate strong incentivisation to mitigate impacts or restore functions impacted
Human Resources - Staff training programmes	35	Business Continuity: Presence of cross-departmental Local Authority/Municipality staff training programmes, which impart knowledge and skills to staff that can be used in emergencies	Is there a Local Authority intra-departmental Civil Protection Training Programme that supports staff roles in Preparedness, Response, Recovery and Mitigation activities?
Human Resources - Engagement Specialists	36	Presence of staff trained / employed by key agencies to explicitly engage communities in hazard-related issues and contingency planning	Do IEM agencies and organisations employ staff to engage communities with emergency planning at the local scale?
Human Resources - Role description	37	Details of Social/Civil Protection role during emergencies included in Local Authority Social-Protection/Social Welfare related	Local Authority Social-Protection Departments employee role profiles examined for emergency-role related clauses

		role profiles	
Human Resources - Wardens - system/protocols	38	IEM plans include accedited training protocols for Hazard-Warden based warning and informing system (i.e. door-knocking)	Does an accredited hazard-warden scheme, which is integrated into the Total hazard-warning system, exist in the location
Structural	39	Property-Level Protection (PLP)	PLP measures fitted (no. buildings) as % of all hazard exposed buildings
Structural	40	community level protection	% of flood-hazard exposed properties protected by structural measures
Non-Structural	41	Loss-sharing - Insurance	Loss-sharing: Insurance - % of hazard-exposed properties that are insurable to a sector-acceptable risk level at 'affordable' premium cost
Non-Structural	42	Loss-sharing - Government	Loss-Sharing: Relief (Govt/LA) Is there a formal process in place through which locally-affected communities can draw on Govt support?
Flexible grant/compensation system	43	Loss-Sharing - Grants	Loss-Sharing: Relief (Charity sector): Availability of a flexible community grant system that can pay out for disruption-related loss
Grant-funding organisation	44	Loss-sharing - 3rd sector Org	Presence of County/Municipality-Level Community Funding Organisation, capable of collecting donations and distributing emergency and mitigation-related grants
Flexible grant/compensation system	45	Flexible Agricultural Grants	Agri-grant scheme funding which can be redeployed to enable recovery activities

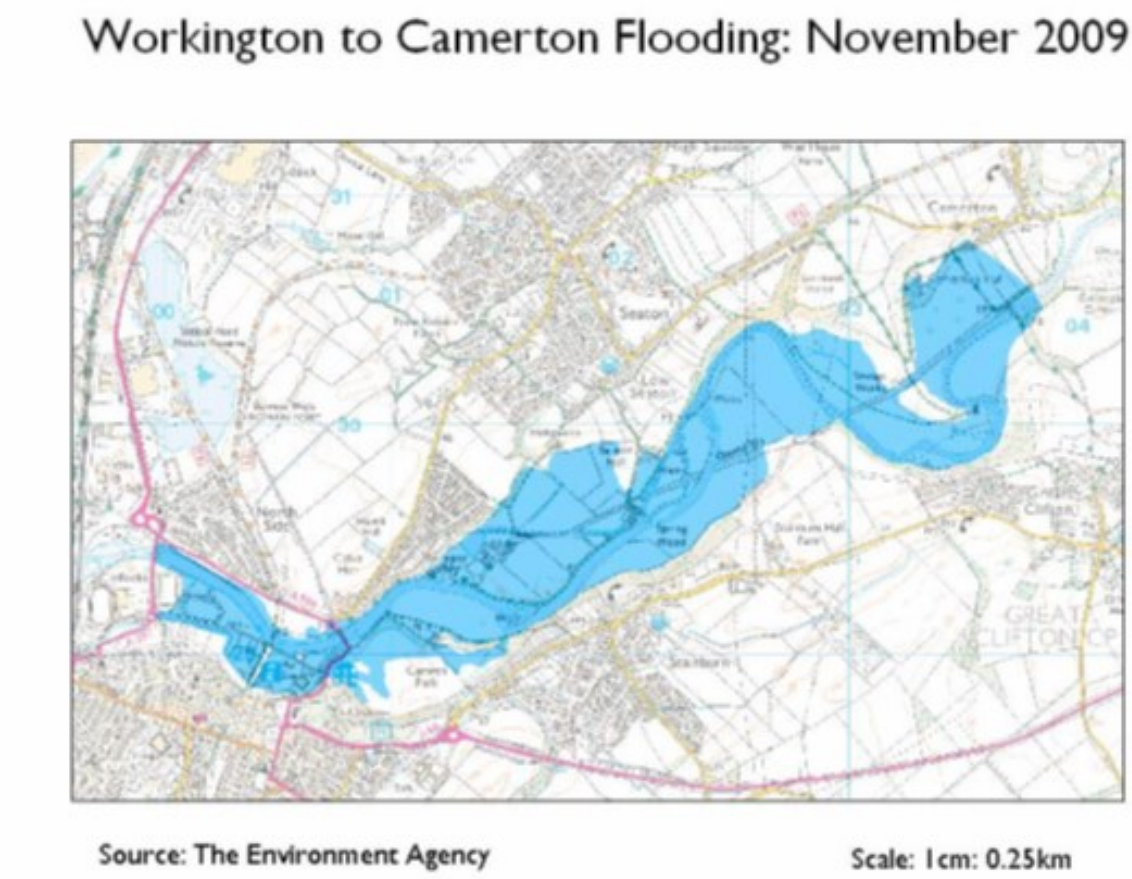
Flexible grant/compensation system	46	Diversity of financial resources attributed to community-capacity building	Range of resource streams from which community-capacity building grants and programmes are funded

Appendix 5:

Maps

1) Workington (Flood outline)
2) Cockermouth (Flood Outline)
3) Keswick (Flood outline)
4) Braithwaite
5) Lorton Vale

Workington



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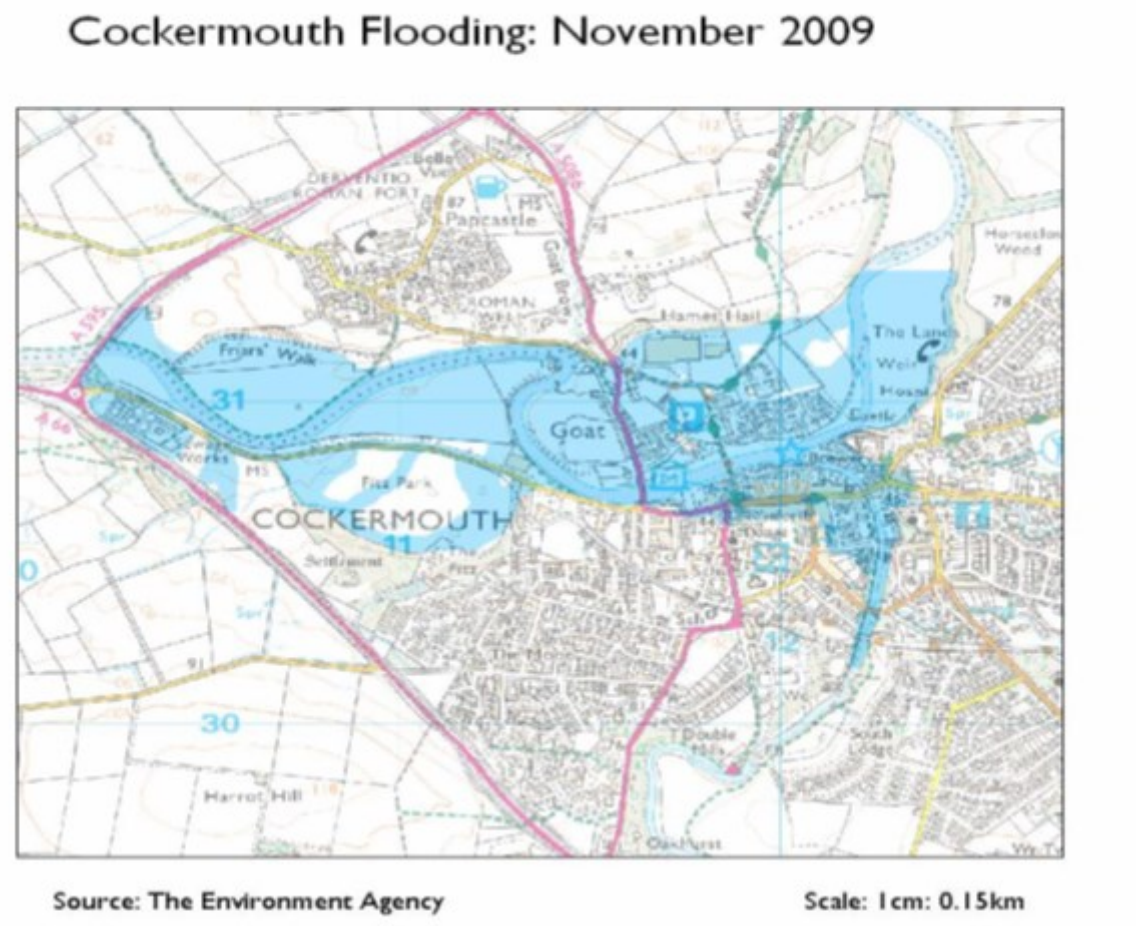
Cockermouth



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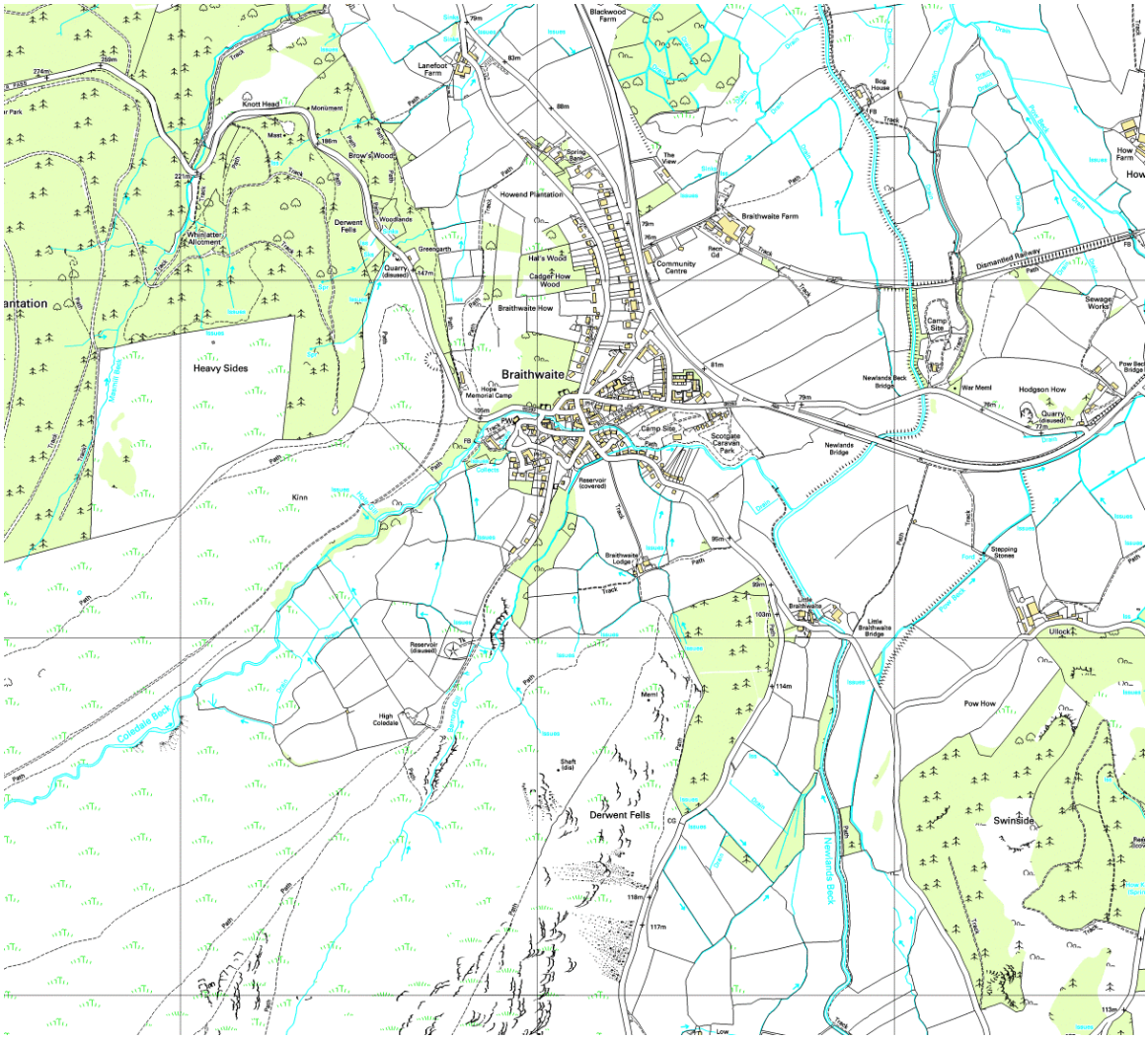
Keswick

Keswick Flooding: November 2009

Source: The Environment Agency

Scale: 1cm: 0.15km

Braithwaite (no flood outline available)



Lorton Vale and the River Cocker (no flood outline available): Low Lorton circled

emBRACE

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